TROPICAL DISEASES BUREAU.

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DISEASES DUE TO PROTOZOAN PARASITES.

CROSS (H. E.) & PATEL (P. G.). **Camel Surra.**—*Punjab Dept. Agric. Vet. Bull. No. 8 of 1922.* pp. 1–19. Lahore: Govt. Printing. 1922.

This little pamphlet is a short survey of our knowledge of camel surra, and contains certain details resulting from recent investigations.

Observations made on auto-agglutination of the red cells and leucocyte counts have not been found to give reliable results in connexion with diagnosis.

As a result of observations extending over a number of years, the authors come to the following conclusions regarding the course of the disease in camels :—

1. Infected camels if worked invariably die of the disease.
2. Camels infected when under one year, well fed and not worked do not die of surra.
3. Camels infected at six years or over die in two to six years even if well fed and not worked.
4. The duration of the disease depends upon the age at which infection takes place. Old camels die more quickly than young ones. The acute cases of surra are usually seen in camels which contract the infection when old.

Young ponies infected with camel surra frequently live for several years if not worked. Buffaloes do not die from camel surra, nor do they lose condition when infected. They may act as reservoirs, as they are a favourite host for Tabanidae.

Goats are similar to the buffalo with regard to camel surra, and they may act as a reservoir, as they are hosts of ticks which may play a part in the transmission of the disease. Sheep occupy a position similar to that of goats. Dogs are susceptible to camel surra and die within a few months.

Excellent results have been obtained in the treatment of the disease by the intravenous injection of tartar emetic in 1 per cent. solution in distilled water, injected at body temperature. The injections are given on alternate days and the dose is gradually increased from about

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50 to 200 cc. (*i.e.*, a minimum of 28 to 30 g. of the salt are given in all). The solution should be given very slowly by gravitation. Salt solution should be injected after the emetic solution to prevent its escape into the subcutaneous tissue with resulting abscess formation. It is dangerous to give injections when trypanosomes are recognizable in the blood. Any camel showing loss of appetite should not be injected for a few days. Similarly, lachrymation is an indication that injections should be suspended for a time.

The following Tabanidae have been found capable of transmitting camel surra directly: *T. nemocallosus, T. rubidus, T. hilaris* and *T. albimedius.*

The authors state that no positive results were obtained with muscids (*Philaematomyia insignis* and *Stomoxys calcitrans*).

No evidence could be obtained that any cyclical transmission occurs through the agency of Tabanidae. These were tested up to 29 days after the infecting meal. No evidence has been obtained that fleas (*Ctenocephalus felis*) can transmit surra.

Reference is made to the authors' recent discovery regarding the transmission of surra by ticks (*O. crossi*).

A brief outline of the life-history of Tabanus is given and this is followed by a tabular statement of the four chief features of Tabanus, Haematopota, Chrysops, and Pangonia.

In connexion with the measures necessary for the control of surra the suggestion is made that practical use may possibly be made of the destruction of egg-masses of Tabanidae by certain parasites (unspecified).

The authors are of the opinion that none of the dressings yet devised for the protection of camels against attacks on the part of flies is of practical value. Watery dressings are valueless as soon as they are dry, and oily dressings cause blistering. The protection afforded by sheets of light but strong material is possibly valuable and the method is worthy of trial.

BAERMANN (G.). **Die Behandlung der Surra mit "Bayer 205."** [The Treatment of Surra with "Bayer 205."]—*Beihefte z. Arch. f. Schiffs- u Trop.-Hyg.* 1922. Vol. 26. No. 2. pp. 73–123. (1–55.)

The author's investigations have been carried out in the Malay Archipelago, where surra not only causes heavy losses among horses, cattle, buffaloes and dogs, but even prevents these animals from being kept. Horses and dogs are the principal victims; the latter if well looked after recover, but remain as virus carriers. These, however, sometimes show symptoms when trypanosomes are present in their blood.

The original strain used in the experiments was obtained from a buffalo which was dying of surra.

The drug was used in 5 or 10 per cent. solution in distilled water and freshly prepared. The dose for guinea-pigs is about 0·025 g., for rabbits, 0·1–0·2 g. Sheep and goats can take 1·5 g. Healthy horses may be given 3 g. per 50 kg., but the total dose should not exceed 10 g. in any case.

If too large doses be given podo-dermatitis is produced, extensive oedema and erythema are also likely to be produced. The urine

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may contain small quantities of albumen. There is at the same time marked wasting, weakness and anaemia.

Healthy animals show a varying susceptibility to "Bayer 205," but, as a general rule, the symptoms of poisoning bear a relationship to the dose administered. No evidence was obtained in the treatment of infected animals that the destruction of the trypanosomes was in any way responsible for the symptoms, as they appeared whether the drug was given during a paroxysm or during a remission.

It was noted that samples of the drug which had been kept in large bottles in the laboratory for a year and which had been frequently exposed to the air produced toxic effects in smaller doses than the fresh drug.

Although sterilization by means of a single dose is the ideal to be aimed at, certain factors, such as the duration and severity of the disease, and general condition of the animal, must be taken into consideration.

Under favourable circumstances doses of 2 to 2·5 g. per 50 kg. body-weight may be given. It is no advantage to give a small preliminary dose; such a procedure is actually inadvisable. With a view to preventing relapses doses of 1 to 1·5 g. per 50 kg. should be given two or three times at intervals of 25 to 35 days.

In severely affected animals the first dose should not exceed 1 g. per 50 kg. The subsequent doses should be smaller than those given above. The intervals between administrations should be shorter, and three or four should be given. It is disadvantageous to spread the administration of a dose over a number of days.

Horses which show more than one relapse are better destroyed.

Very few accurate observations have been made with infected cattle, but in view of the lower susceptibility of these it appears to be probable that a small dose can be used.

As a result of his experiments, which are detailed at some length in the paper, the author concludes that there is a prospect of effecting a cure in from 50 to 75 per cent. of cases.

MIGONE (L. E.) & OSUNA (T.). **Behandlung des "Mal de caderas" der Pferde mit dem neuen Mittel "Bayer 205."** [The Treatment of Mal de Caderas with "Bayer 205."]—*Arch. f. Schiffs- u. Trop.-Hyg.* 1922. Nov. Vol. 26. No. 10. pp. 289–304.

This paper contains an account of experiments in South America carried out with "Bayer 205" on horses affected with mal de caderas.

In their first experiments the authors used a 10 per cent. solution made up in normal salt solution. This was injected intravenously into four animals weighing 250–300 kg. (two horses), 200 and 150 kg. respectively, and the doses were 70 and 20 cc. for the larger and smaller animals respectively.

In one of these animals there was a rise of temperature to 39.6° during the first 12 hours. The horse coughed, sought the shade and shifted its weight from leg to leg. There was sweating of the neck, flanks and groin. After 24 hours the blood showed a distinct increase in the number of lymphocytes and blood-platelets and trypanosomes had almost disappeared. After 36 hours they had disappeared completely and the temperature had fallen to 38·8°.

At 24 hours rather severe symptoms made their appearance. There was swelling of the lips, pharynx and testicles. The animal was able to move only slowly owing to pain in the joints and "swelling of the

hoofs." On the third or fourth day eczema appeared round the anus, on the nasal mucous membrane, prepuce, and a little on the glans penis. These symptoms persisted for 8 to 10 days.

The two horses which received 2 gm. each showed none of these symptoms, and a cure was effected more rapidly.

The two which had been given 7 gm. were injected after an interval of 15 days with 4 gm. without any symptoms being produced, and after a further interval of eight days with 3 gm. No untoward symptoms followed these injections. Those which had had 2 gm. originally were subsequently given 3 and 4 gm. at intervals of eight days.

The symptoms of mal de caderas entirely disappeared. One of the animals was partially blind and deaf as a result of the disease, but both of these conditions quite cleared up 10 days after the last injection. From August, 1921, when the injections were first given, until the following May guinea-pigs were inoculated every two months with blood from these horses without causing infection in any of them. In a later experiment a healthy animal was stabled next to an experimentally infected one. The healthy horse failed to contract the disease. With a view to testing the prophylactic properties of the drug it was given an intravenous injection of 2 g. and six days later 40 cc. of blood from the infected horse. The same day the infected horse was given 2 g. No trypanosomes could be found in the blood of either. Eight days later the infected animal was given a second dose of 3 g. Improvement was noticeable. A third dose of 4 g. was given six days later. The improvement continued. Subsequently repeated examinations and experimental inoculation of guinea-pigs failed to show the presence of trypanosomes in either of the horses.

The authors have applied the treatment on infected ranches, and up to the time of writing have cured 107 horses and have treated 219 prophylactically. They are of opinion that in view of the extreme advisability of establishing a diagnosis early, ranchers should learn how to use the microscope.

Intravenous injection is the best method of administering the drug, as subcutaneous injection produces inflammation.

Sound horses passing through infected areas should be injected prophylactically.

The curative doses of " 205 " are 2, 3 and 4 g. given at intervals of eight days.

The best solution to use is 10 per cent. in normal salt solution.

MIGONE (L. E.). **El Tratamiento del Mal de Caderas.** [The Treatment of Mal de Caderas.]—*Bull. Soc. Ganadera del Paraguay.* 1922. Apr. Vol. 1. pp. 124–129. [Ex. *Bull. Inst. Past.* 1922. Nov. 15. Vol. 20. No. 21. p. 860.]

Among the drugs tried by the author urotropine and " Bayer 205 " have been the most effective.

Urotropine is given intravenously in a 40 per cent. solution and the dose is 1 cc. per 10 kg. body-weight. Complete sterilization is effected, as tested by guinea-pig inoculation with 5 cc. of blood, after 12 to 14 injections.

" 205 " is given in the same manner in a 10 per cent. solution in normal saline. Three injections are given at intervals of eight days, and the doses are 2, 3 or 4 gm. of the solid according to the size of the animal.

As a prophylactic the dose of " 205 " is 2 g.

HESSELBACH (Kurt). **Die trypanozide Wirkung von " Bayer 205 " auf** *Trypanosoma equiperdum.* [The Trypanocidal Effect of " Bayer 205 " on *T. equiperdum.*]—*Centralbl. f. Bakt.* 1. Abt. Orig. 1922. Nov. 18. Vol. 89. No. 4/5. pp. 48–71. With 1 plate & 1 text fig.

The first part of this paper, amounting to eight pages, deals with (1) a historical and zoological account of trypanosomes; (2) a more particular account of dourine and its causal organism; (3) the drugs which have been employed for the treatment of trypanosomiases up to the present, and the experiments which have been carried out by other investigators with " Bayer 205. "

The author then gives an account of his own experiments dealing with the effects produced by the drug *in vitro* and *in vivo*, and gives a short summary of each experiment performed.

The following is an abstract of his summary : a 1 per cent. solution of " 205 " produces little effect *in vitro*, and the effects become more marked with increased concentrations; 7½ per cent. solution renders trypanosomes motionless in 50–60 minutes, and a 10 per cent. solution produces a similar effect in five minutes. This is held to afford an indication of the doses advisable in treating affected animals, since in all previous experiments in the treatment of trypanosomiases it has been found necessary to give the maximum safe dose.

The first effect of " Bayer 205 " upon trypanosomes *in vivo* would appear to be one of stimulation, as is shown by the number of parasites in the first stage of division, namely, with divided blepharoplasts but the process appears to stop there, as few of these show divided nuclei.

The drug leads to a breaking up of the nucleus, its fragments being scattered throughout the cytoplasm; subsequently the body becomes swollen, the undulating membrane and flagellum become altered and trypanolysis occurs.

In no case did a guinea-pig which was treated with " 205 " show a relapse.

Trypanosomes taken from an individual which has been treated with " 205 " some time (3½ hours) before may when injected into another animal set up the disease. " Bayer 205 " is said to be of value as a prophylactic.

Guinea-pigs were used throughout the experiments.

DAHMEN (H.). **Die Serodiagnostik der Beschälseuche.** [The Serum Diagnosis of Dourine.]—*Arch. f. wissen. u. prakt. Tierheilk.* 1922. Mar. 11. Vol. 47. No. 5. 319–353.

This article is so full of details regarding technique and of records of tests that as a whole it does not lend itself to abstraction. The author's conclusions may be summarized as follows :—

For complement deviation tests an alcoholic extract of trypanosomes is preferable to a watery one. The appearance of fresh clinical symptoms such as plaques is causally connected with a reduction in the amount of complement-deviating substance in the serum of horses affected with dourine.

Deviation of the complement in dourine is specific. Watery or alcoholic extracts of organs do not give positive reactions.

Agglomeration is a very useful test and in doubtful cases enables a decision to be arrived at. Agglutination in doubtful cases does not permit of a definite decision. Precipitation with watery extracts is

inferior to complement deviation. The Sachs-Georgi reaction is of no value for the diagnosis of dourine. The lipoid-fixation test is superior to the complement fixation and with trypanosome extracts is specific. The lipoid precipitation reaction is also better than the deviation of the complement test.

Generalization in dourine may be delayed until as long as eight months after infection, and antibodies only appear after generalization has occurred. Hence the necessity of a second test.

Neosalvarsan, silversalvarsan, and "Bayer 205" all give good results in the treatment of the disease, but the first two are preferable to the last on account of their lower toxicity.

The deviation of the complement test gives negative results when a case is treated successfully; on the other hand the lipoid-fixation test gives positive results in spite of treatment.

The author succeeded in transmitting the trypanosome to other horses, but not to small animals.

The foals of dourine mares do not react after the third month.

BESSEMANS (A.) & LEYNEN (E.). **Valeur antigénique de certains spirochètes et de différentes souches de trypanosomes pour le diagnostic de la Dourine chez les equidés par la réaction de Bordet-Gengou.** [The Antigenic Value of Certain Spirochaetes and Trypanosomes for the Diagnosis of Dourine by the Bordet-Gengou Test.]—*Compt. Rend. Soc. Biol.* 1922. Vol. 87. No. 28. pp. 797–800.

The spirochaetes used were *T. pallidum, S. icterohaemorrhagiae,* and the trypanosomes, *T. rhodesiense, T. lewisi,* and a bird trypanosome.

Cultures were used of all except *T. rhodesiense* and *T. lewisi,* and none of the cultivated organisms was found to be of any value.

With the trypanosomes, which were obtained from infected animals when required for antigen, specific reactions were obtained, especially with the former. The antigenic power of *rhodesiense* and *lewisi* was, however, less than that of the trypanosomes of surra, nagana, and dourine, with which the authors have previously carried out experiments. Of these three the first two have given the best results. The strains of *T. equiperdum* used were of American and Algerian origin.

The authors, in spite of numerous attempts, have not been able to isolate the trypanosome which is the cause of the disease in Belgium.

In their tests they found that the trypanosomes obtained from animals at the first crisis were superior antigenically to those obtained at subsequent crises.

SERGENT (Edm.) & DONATIEN (A.). **Transmission naturelle et expérimentale de la trypanosomiase des dromadaires par les Stomoxes.** [The Natural and Experimental Transmission of Trypanosomiasis of the Dromedary by Stomoxys.]—*Arch. Insts. Pasteur de l' Afrique du Nord.* 1922. Sept. Vol. 2. No. 3. pp. 291–315. With 1 fig.

This paper must be referred to in the original by those specially interested, as it contains details of the experiments carried out by the authors. Their conclusions, however, may be quoted as follows:—

Under natural conditions trypanosomiasis of the dromedary is transmitted in two ways: in the open country by Tabanidae, the

larvae of which swarm in the damp sand in the valleys; in inhabited parts by Stomoxys, the larvae of which live in the dung heaps in stables.

In both cases the transmission is mechanical; no cycle of development of the trypanosome has been discovered in the flies. The prolonged course of the disease in the dromedary makes the animal the reservoir of the virus.

SELMI (G.). **Azione tossica dell' estratio di** *Trypanosoma brucei* **nei giovani conigli.** [The Toxic Action of Extracts of *T. brucei* on Young Rabbits.]—*La Clin. Vet.* 1922. Oct. Vol. 45. No. 13. pp. 561–565.

After referring briefly to the work already done in connection with the demonstration of toxins liberated from trypanosomes, the author describes his own experiments.

His trypanosome extract was made by shaking a suspension of trypanosomes in normal salt solution for 24 hours with glass beads. The injections were made into the marginal vein of the ear.

Details of two experiments are given. The first rabbit received 1, 2 and 3 cc. of the suspension (1 to 20) on three successive days. The symptoms produced by each became progressively more severe, and ranged from slight depression and acceleration of respiration to prostration, muscular spasms and death two hours after injection.

The second rabbit received two injections each of 4 cc. Similar symptoms were observed and death took place an hour and a half after the second.

Examinations were made of the blood during the experiments, a number of estimations of the corpuscular content, etc., of normal rabbit blood having been made beforehand.

A table shows the results of blood counts, etc., of two rabbits injected with trypanosome extract. It would appear that these two are not those referred to in the text of the paper.

CARSON (H. H.). **Nagana and the Tartar Emetic Treatment.**—*Jl. Dept. Agric., Union of South Africa.* 1922. Sept. Vol. 5. No. 3. pp. 249–253.

After dealing with the symptoms which may be seen, the author gives details of treatment with tartar emetic.

Adult cattle may be given 1·5 g. daily on five consecutive days, and a similar dose may be used for horses, donkeys and mules. Dogs of 25 lb. body-weight may be given 0·1 to 0·125 g. The drug is dissolved in normal salt solution in the proportion of 1 g. to 20 cc. and sterilized. The intravenous method of injection is to be preferred, but extreme care must be taken to prevent any of the injection going under the skin, as this is likely to lead to abscess formation.

If an overdose be given the symptoms produced are hurried and shallow respiration, acceleration of the pulse, trembling of the muscles, sweating, and a disinclination to move.

As a routine procedure five injections are given. The condition of the animal is the best guide as to whether treatment has been successful or not. All infected and suspected animals should be isolated during the fly seasons and treated weekly.

VAN SACEGHEM (R.). *Trypanosoma theileri* **au Ruanda.** [*T. theileri* in Ruanda.]—*Ann. Soc. Belge. Méd. Trop.* 1922. Vol. 2. No. 1. pp. 113–114.

The author records the occurrence of *T. theileri* in cattle in Ruanda, and notes that it is very frequently met with. Attempts to transmit it to other animals failed. *Hippobosca rufipes*, the fly credited with the transmission of the trypanosome in South Africa, has not been observed in Ruanda.

DUKE (H. L.). **On the Zoological Status of the Polymorphic Mammalian Trypanosomes of Africa and their Relation to Man.**—*Parasitology.* 1921. Nov. Vol. 13. No. 4. pp. 352–397. With 1 text fig.

This paper is written in support of the thesis that the polymorphic trypanosomes in mammals in Africa constitute a single species which is divisible into a number of more or less distinct strains or varieties. It is, however, impossible to give a brief abstract of the evidence which the author brings forward to support the view, which is of an indirect nature.

ARCHIBALD (R. G.). *Trypanosoma rhodesiense* **in a Case of Sleeping Sickness from the Sudan.**—*Ann. Trop. Med. & Parasit.* 1922. Oct. 18. Vol. 16. No. 3. pp. 339–340.

Three cases of human trypanosomiasis were brought to Khartoum from the Sleeping Sickness Camp at Tembura, Bahr-el-Ghazal Province. To minimize the possibility of spreading the infection on the journey, each patient had two injections of 0·5 g. of atoxyl. On arrival at Khartoum trypanosomes could not be detected microscopically, but a gerbil inoculated with gland juice from a case showing enlarged glands, somnolence and slight pyrexia developed an intense infection after 66 days. Posterior nucleated forms were found. *Glossina fuscipes* and *G. morsitans* are ubiquitous in the Tembura district. Further details regarding the trypanosome are to be published later.

NAVARRO MARTIN (A.) & STEFANOPOULO (G. J.). **Action de l'aminophénolarsinate de soude (189) sur les trypanosomiases expérimentales du cobaye.** [The Action of Aminophenolarsenate of Soda (189) on Experimental Trypanosomiasis in the Guinea-Pig.]—*Ann. Inst. Pasteur.* 1922. Aug. Vol. 36. No. 8. pp. 619–623.

The results obtained by Navarro in the treatment of mice infected with *T. brucei* and *T. rhodesiense* with preparations made from pentavalent arsenic and with the sodium salt of tri-amino-tetra-oxyphenylarsenic acid have been previously reported [see this *Bulletin*, Vol. 10, p. 30]. The present experiments have been carried out upon guinea-pigs infected with *T. brucei* and *T. gambiense*.

The maximum dose of "189" tolerated by a guinea-pig by subcutaneous injection is from 0·25 to 0·3 g. per kilog.

Eighteen guinea-pigs inoculated with a strain of *T. brucei*, which generally produced a fatal result in from 20–30 days, were given varying doses of "189" between 7 and 10 days after inoculation when trypanosomes were plentiful in the blood. From these experiments it was found that the curative dose was about one third the maximum tolerated dose. If the drug is given in two small doses a degree of resistance to arsenic is developed. Of seven guinea-pigs which were

given too small doses to begin with, and which subsequently received further doses when relapses occurred, four recovered and three died.

Similar experiments were carried out with guinea-pigs infected with a strain of *T. rhodesiense*, which ordinarily proved fatal to guinea-pigs in from 30 to 40 days. The therapeutic coefficient in this case was similar to that obtained with the nagana infected guinea-pigs, namely 1 : 3·5.

When relapses occurred with *T. rhodesiense* a second dose proved to be more effective than in the case of *T. brucei*.

The injections were made with a ten per cent. solution and produced no local reaction.

CLAPIER (P.). **Premiers essais au Gabon de l'acide oxyaminophénylarsinique (Sel de Soude ou 189), dans la trypanosomiase humaine.** [First Attempts in treating Human Trypanosomiasis at Gabon with Oxyaminophenylarsenic Acid.]—*Bull. Soc. Path. Exot.* 1922. Oct. Vol. 15. No. 8. pp. 729–755.

This paper contains detailed statements regarding 21 cases treated in different ways with the drug.

The majority of the cases were treated either by subcutaneous or intramuscular injection. Good results were obtained when the cases were early ones, but in advanced cases relapses were frequent even when large doses were given repeatedly.

Only one case was treated by intravenous injection and this was under observation for about three weeks. The case was in the third phase. Trypanosomes disappeared in seven hours.

By the mouth the drug was useless.

VAN DEN BRANDEN & VAN HOOF. **Le " Trepol " ou tartro-bismuthate de potassium et de sodium dans la Trypanosomiase Humaine.** [Trepol (Tartro-bismuthate of Potassium and Sodium) in the Treatment of Human Trypanosomiasis.]—*Bull. Soc. Path. Exot.* 1922. Oct. Vol. 15. No. 8. pp. 692–693.

Three patients were put under treatment with Trepol. One of these received five doses of 0·3 g. in the course of 20 days, the second three similar doses, and the third five doses of 0·3 g.

Trypanosomes disappeared from the circulation for a short time only.

VAN DEN BRANDEN & VAN HOOF. **Essais du silbersalvarsan et du sulfarsénol dans la trypanosomiase humaine.**—*Ann. Soc. Belge de Méd. Trop.* 1922. Vol. 2. No. 1. pp. 125–130.

The authors' conclusions are that the combination of silver with salvarsan does not improve it as a trypanocide.

Sulfarsenol has some advantages over similar products from the point of view of administration, but is not superior to them therapeutically.

ARAGÃO (H. DE BEAUREPAIRE). **Transmissão da Leishmaniose no Brazil pelo** *Phlebotomus intermedius*. [The Transmission of Leishmaniasis in Brazil by *Phlebotomus intermedius*.]—*Brazil Medico.* 1922. Mar. 18. Vol. 36. No. 11. pp. 129-130. With 1 fig.

In a damp and wooded locality in Rio de Janeiro where a centre of leishmaniasis developed *Phlebotomus intermedius* was present in large

numbers. Other insects found were *Aëdes* (*Culex*) *confirmatus*, *A. taeniorhynchus* and other mosquitoes, and *Simulium pertinax*. No ticks were discovered. A dog inoculated in the nose with an emulsion of 5 *P. intermedius*, which had been fed upon a case three days previously, developed a small nodule about 3½ months later and typical leishmania were found to be present in small numbers. Flagellates resembling cultural forms of leishmania had been found in the flies.

REMLINGER (P.). **Un cas de Kala-azar infantile observé au Maroc.** [A Case of Infantile Kala Azar in Morocco.]—*Arch. Insts. Pasteur de l'Afrique du Nord.* 1921. Vol. 1. No. 3. pp. 240–241. With 1 plate.

Infantile kala azar has not been reported previously from Morocco.

LEGER (Marcel) & BÉDIER (E.). **Piroplasme du Renard d'Afrique, *Fennecus dorsalis* Gray.** [Piroplasm of the African Fox.]—*Compt. Rend. Soc. Biol.* 1922. Oct. Vol. 87. No. 29. pp. 934–935.

The parasite described is similar to one previously observed by the authors in the blood of a lion.

The majority of the organisms were rounded in shape and measured about 1·5 μ in diameter, but some were oval measuring 2 μ by 1 μ. No distinctly elongated or bacillary forms were seen, and dividing forms were scanty. Forms were observed, however, in which nuclear division had taken place; the fragments of chromatin in these were disposed in a cruciform manner, but the cytoplasm had not divided.

Smears from the liver, spleen, kidneys and lungs showed no forms other than those seen in the blood.

They place it in the genus *Nuttallia* and name it *Nuttallia bauryi*.

SACHELAIRE (V.) & JONESCU (A. L.). **Un cas de Nuttaliose.** [A Case of Nuttalliosis.]—*Archiva Veterinara.* 1922. Vol. 16. No. 3. pp. 113–118. With 1 text fig.

The horse referred to in this article was a serum producer, and had been stabled for several months. The facts of the case appear to indicate that the infection may possibly have been brought in through the medium of infected ticks in forage.

MARTIN (A.) & LASSERRE (R.). **Le "Trypanbleu" dans le traitement de la piroplasmose canine.** [Trypanblue in the Treatment of Canine Piroplasmosis.]—*Rev. Vét.* 1922. Dec. Vol. 74. No. 12. pp. 751–755.

This article contains no new information. It appears to be in the nature of a reminder to practitioners of the value of the drug. Canine piroplasmosis is said to be becoming more common, at least in the south-west of France.

NOMI (S.) & MATSUO (T.). **On the Spirochaetes in Swine.**—*Jl. Jap. Soc. Vet. Med.* 1922. Sept. Vol. 1. No. 3. pp. 140–141.

The authors record the morphological characters of spirochaetes encountered in four lesions in swine.

RAO (M. A.). *Haemogregarina canis.—Madras Vet. Jl.* 1922. July. No. 15. pp. 7–9.

The parasite was found in the polymorphonuclear leucocytes of a dog which presented the symptoms usually associated with piroplasmosis. More than 70 per cent. were invaded.

A similar organism has been found in a blood smear sent to the Madras Veterinary College. In this case also the symptoms suggested piroplasmosis.

NIESCHULZ (O.). **Über Entamöben des Hausrindes.** [The Entamoebae of the Ox.]—*Arch. f. Protist.* 1922. Oct. Vol. 45. No. 3. pp. 410–412. With 1 text fig.

The author refers to the scanty references in literature to the occurrence of entamoebae in cattle and describes the vegetative form which he found in the rumen and the mononuclear cysts which he detected in the faeces. The vegetative elements measured 5–10 microns in diameter. In living specimens there was more or less clear distinction between the endo- and ectoplasm. The rounded nucleus was distinctly double-contoured. In stained preparations a central karyosome is visible in the centre of the nucleus. Bacteria were sometimes seen in the cytoplasm. The cyclical changes seen in the karyosome of *E. histolytica* were observed in this species.

The encysted forms found in the faeces measured 5–12 microns. The cyst membrane appeared to be single-contoured, but owing to the small size of the organism it was not possible to be quite certain of this. Irregular chromidia were present in the protoplasm, and these were sometimes large. Not infrequently specimens showing large central vacuoles were observed.

Multinuclear cysts have never been seen, and in faeces several weeks old further development of the cysts has not been seen.

No proof can be furnished that the two forms observed are the same species, but it appears to be probable.

VAN NEDERVEEN (H. J.). **Infectieproef van het Rund met Konijnencoccodiën.** [The Infection of Cattle with the Rabbit Coccidium.] —*Tijdschr. v. Vergelijk. Geneesk. enz.* Leiden. 1922. Nov. 25. Vol. 8. No. 2/3. pp. 88–98. With 4 figs. [English Summary, pp. 100–101.]

Two calves were fed with sporulating rabbit coccidia, and subsequently coccidia were found in the faeces for three or four weeks only.

After an interval of three months the faeces were examined again and oocysts were found to be present in large numbers. Many of these resembled cattle coccidia in point of size, but many were present which resembled the parasite of the rabbit.

The coccidia found in naturally infected cattle could not be induced to sporulate. Those from the calves sporulated to the number of 10–25 per cent. The rabbit coccidia sporulated to the extent of 80 per cent. of those examined.

The faeces of the calves were examined in " the ordinary way " before they were fed with the rabbit parasites, and it is noted that special methods for enriching the specimens examined were not employed.

Post mortem examination of one of the calves revealed the presence of coccidiosis, and *Gastrocystis smithi* was found in the jejunum and ileum.

LYNCH (K. M.). *Tricercomonas intestinalis* **and** *Enteromonas caviae* **n. sp. and their Growth in Culture.**—*Jl. Parasit.* 1922. Sept. Vol. 9. No. 1. pp. 29–32. With 1 text fig.

Regarding the latter parasite the author states that *Enteromonas caviae* closely resembles *Enteromonas hominis* (DA FONSECA, 1915). There appear, however, to be only two anteriorly directed flagella, and the recurrent one is not adherent to the body. Encystment has not been recognized.

BLANCHARD (M.) & LEFROU (G.). **Présence de Spirochètes dans le sang d'européens atteints de fièvre bilieuse hémoglobinurique. Le problème étiologique de cette Spirochétose.** [The Presence of Spirochaetes in the Blood of Europeans affected with Biliary Haemoglobinuria. The Problem of the Etiology of this Disease.]—*Bull. Soc. Path. Exot.* 1922. Oct. Vol. 15. No. 8. pp. 699–722.

BOONE (R. C. P.). **Piroplasmose Bovine ou Hémoglobinurie infectieuse.** [Bovine Piroplasmosis or Infectious Haemoglobinuria.]—*Jl. Sta. Agron. Guadeloupe.* Pointe-à-Pitre. 1922. Vol. 2. Nos. 1 & 2. pp. 14–20 & 49–56.

HEGNER (R. W.) & BECKER (E. R.). **The Diagnosis of Intestinal Flagellates by Culture Methods.**—*Jl. Parasit.* 1922. Sept. Vol. 9. No. 1. pp. 15–23.

PERRY (H. Marrian). **Some Observations on the Occurrence of Leishmania in the Intestinal Tissues in Indian Kala-Azar, on the Pathological Changes occasioned by their Presence and their Possible Significance in this Situation.** —*Jl. Royal Army Medical Corps.* 1922. Nov. Vol. 39. No. 5. pp. 323–329.

DISEASES DUE TO METAZOAN PARASITES.

CAWSTON (F. G.). **Fresh Water Snails responsible for the Spread of Bilharzia Disease in Portuguese East Africa.**—*Jl. Trop. Med. & Hyg.* 1922. Oct. 2. Vol. 25. No. 19. pp. 305–306. With 1 text fig.

In pools in the Municipal Gardens at Lourenzo Marques (which contain the Zoo), the author found *Planorbis pfeifferi*, and these contained schistosomes resembling *Schistosomum mansoni*. *Physopsis africana* also was found to be abundant. Some of these were infested with cercariae of various kinds. A common cercaria which also occurred in a snail resembling Isidora in the same pool was longer and narrower than *S. haematobium*, and was possibly *S. bovis*.

In Natal, *P. africana* has been found infested with *S. haematobium*, *S. mansoni*, and *S. bovis*. A much smaller schistosome found in *P. africana* had flat fin-like prongs to its divided tail, and its outline resembled Bilharzia, but it was provided with black eye spots and resembled *C. oculata*, of Natal.

It is noted that patients are being treated with tartar emetic by intravenous injections. Dr. Amaral LEAL drew attention to the severe toxic effects which may be produced if the solution is boiled for long before injection.

MICELI (D.). **Valore pratico della Deviazione del Complemento applicata cella echinococcosi bovina.** [The Practical Value of the Deviation of the Complement in the Diagnosis of Echinococcus Infection in the Ox.]—*La Clin. Vet.* 1922. July. Vol. 45. No. 10. pp. 353–356.

The author concludes that the results obtained are not constant.

MACFIE (J. W. S.). **The Ascaris of Cattle.**— *Ann. Trop. Med. & Parasit.* 1922. Oct. 18. Vol. 16. No. 3. pp. 311–313. With 2 text figs.

The author has been prompted to re-examine material obtained by BEAL from a three-weeks-old calf at Kumasi in January 1921 by the publication of BOULENGER's paper "On *Ascaris vitulorum*, Goeze" (see this *Bulletin*, 1922, Vol. 10, p. 71). Macfie finds the worms similar to those described by BOULENGER (from the Punjab and Northern Rhodesia) in most respects but notes certain differences. These are briefly described. The most notable difference is the number of papillae on the posterior extremity of the male.

"The calf from which the specimens were obtained died from obstruction of the bowels, and after death Major BEAL found the worms in thousands, all intertwined, in the small and large bowels. The calf was only three weeks old at the time of its death, a fact which is of some interest in view of the possibility of pre-natal infection."

BLACKLOCK (B.) & ADLER (S.). **Pulmonary Lesions in Dogs and Cats naturally infected with Nematodes.**— *Ann. Trop. Med. & Parasit.* 1922. Oct. 18. Vol. 16. No. 3. pp. 291–292.

Pulmonary lesions were found to be present in every one of 25 dogs and five cats examined in Freetown, and took the following forms :—

1. Circular haemorrhages, 1–5 mm. in diameter, which were wedge-shaped in section. Lesions were found in dogs a fortnight old.
2. Small irregularly distributed scars.
3. Older animals showed patches of emphysema.

All the animals had either *Ancylostoma caninum* or *A. ceylanicum*, or both, and most of them had Toxascaris or Belascaris.

The number of ancylostomes in the intestines greatly exceeded the number of haemorrhages in the lungs; it is therefore probable that in the majority of cases the haemorrhages caused by larvae leaving the capillaries to enter bronchioles are absorbed without leaving any visible trace.

ADLER (S.). **Ancylostomes in Animals in Freetown.**— *Ann. Trop. Med. & Parasit.* 1922. Oct. 18. Vol. 16. No. 3. pp. 293–294. With 1 text fig.

Ancylostoma caninum was found in young dogs, but in adults both *A. caninum* and *A. ceylanicum* were present. The latter occurs at a higher level in the intestine than the former.

A. ceylanicum was found in adult domestic cats and about half of these had *A. caninum* also.

A civet cat and a genet were found to harbour *A. duodenale*. The two parasites mentioned above were found in these species. Measurements of the parasites are included in the paper.

GORDON (R. M.) & YOUNG (C. J.). **Parasites in Dogs and Cats in Amazonas.**— *Ann. Trop. Med. & Parasit.* 1922. Oct. 18. Vol. 16. No. 3. pp. 297–300.

All dogs examined contained *A. caninum* and 74 per cent. showed *A. braziliense*.

Six out of nine cats had either *A. caninum* or *A. braziliense*, or both.

GORDON (R. M.). **The Occurrence of Ancylostomes resembling *Necator americanus* amongst Domestic Pigs in Amazonas.**—*Ann. Trop. Med. & Parasit.* 1922. Oct. 18. Vol. 16. No. 3. pp. 295–296.

From ten out of fifteen domestic pigs of various ages 175 worms corresponding with *N. americanus* in all respects save size were collected. Details of sizes are given.

BOULENGER (C. L.). **On Some Nematode Parasites of the Camel in India.**—*Parasitology.* 1921. Dec. Vol. 13. No. 4. pp. 311–314. With 3 text figs.

The author establishes the occurrence of *Haemonchus longistipes* in the camel and finds that the specimens which he examined and which were thought to be *Nematodirus spathiger* were in reality *N. mauritanicus* (MAUPAS and SEURAT, 1912), which has up to the present been identified in North Africa only.

The paper contains descriptions of the two species. *H. longistipes* is distinguishable from *H. contortus* by the character of the posterior ray of the bursa, by the large size of the cloacal lip, by the length of the spicules and by the position of the barbs on the latter.

In the female the distinguishing features are the absence of linguiform process over the vulva, and the smaller size of the eggs.

UNION OF SOUTH AFRICA. DIVISION OF VETERINARY EDUCATION & RESEARCH. **The Life History of the Wire Worm of Sheep.**—*Jl. of Dept. of Agric. Union of S. Africa.* 1922. Oct. Vol. 5. No. 4. pp. 326–329.

This paper is a condensed account of the life history of *Haemonchus contortus* and includes short paragraphs upon eradication and diagnosis.

BLACKLOCK (B.) & ADLER (S.). **The Pathological Effects produced by Strongyloides in a Chimpanzee.**—*Ann. Trop. Med. & Parasit.* 1922. Oct. 18. Vol. 16. No. 3. pp. 283–288. With 1 plate & 3 text figs.

When first observed the chimpanzee was suffering from dysentery but no ova or larvae could be found in the faeces. About three weeks later it had a mild attack of diarrhoea but no blood was passed. Numerous rhabditiform larvae of strongyloides were found. Death took place about three weeks later.

The principal abnormalities found on post mortem examination were :—innumerable small recent haemorrhages scattered over the surface of the lungs, dilatation of the surface vessels of the brain, a thickening of the jejunum starting at a point twelve inches below the pylorus and extending for a distance of five inches. At the beginning of this thickening there was a conical tumour 1·5 centimetres in height projecting into the lumen of the gut. Filariform larvae were found in smears from the lungs, trachea and bronchi, in the blood in the right ventricle, pericardial fluid, liver and spleen. They measured from 0·324–0·422 mm. in length. No larvae were found in the brain.

The thickening of the jejunum was due to an increase of lymphoid tissue in the mucosa and sub-mucosa. The muscular and serous coats showed a small-celled infiltration. Innumerable adult worms were present, the majority of which were deep in the mucous membrane,

but they were also found projecting into the lumen and at the level of the circular muscular coat. Ova with developed embryos were found throughout the mucosa.

The tumour comprised a core of muscular tissue surrounded by a thick layer of lymphoid tissue extending up to the muscularis mucosae. Adult strongyloides and larvae were found throughout the alimentary tract. The adults measured 1·8–2·5 mm.

BOULENGER (C. L.). **Strongyloid Parasites of Horses in the Punjab.**— *Parasitology*. 1921. Nov. Vol. 13. No. 4. pp. 315–326. With 5 text figs.

The author refers to and describes where necessary 21 species of strongyloid parasites of horses in the Punjab. None of the species are new. They belong to the genera Strongylus, Oesophagodontus, Triodontophorus, Poteriostomum, Cylicostomum.

LANE (C.). **A Preliminary Note on Two Strongylata from Swine in the Pacific.**— *Ann. & Mag. Nat. Hist.* 1922. June. Ser. 9. Vol. 9. p. 683.

The author describes two new species of nematodes obtained from O'CONNOR (F. W.). They are *Globocephalus connorfilii* and *Crassisoma samoense*. Only morphological details are described.

DRABBLE (J.). **The Kidney Worm of Hogs in New South Wales, *Sclerostomum renium*, n. sp.**— *Jl. Comp. Path. & Therap.* 1922. Dec. Vol. 35. No. 4. pp. 302–305. With 1 text fig.

The kidney worm of the pig in New South Wales, which is fairly frequently met with, has hitherto been mistaken for *Stephanurus dentatus* (*Sclerostoma pinguicola*).

The author describes the characters of the parasite and concludes that it is a new species.

Males measure 25–40 mm. and females 30–54 mm. The posterior extremity of the female is curved ventrally and behind the anus narrows to a spike-like tail. Just in front of the anus, on either side is a knob-like projection of cuticle directed outwards. The vulva is a little in front of the anus and slightly prominent. In the male there are two spicules of equal length. The bursa has a regular ray system ; the dorsal ray divides into two main branches each of which is bifurcated.

Further details of morphology, etc., are promised. Observation has shown that this parasite is becoming increasingly common in young pigs.

The parasites are usually found in diverticula of the ureters, and commonly in the pelvis of the kidney, kidney fat and liver. Less frequently they invade the kidney tissues and sublumbar muscles. As a rule several worms are found together surrounded by a variable quantity of greenish pus.

Hydronephrosis is frequently produced. In an advanced case the kidney may be represented by a fibrous sac, the walls of which contain nodules of about 1 centimetre diameter. These are nests of worms.

The liver lesions rarely contain pus, but are composed of fibrous tissue which is less dense in the centre where there is a small cavity containing a worm or worms which are frequently immature.

Usually no symptoms are observed during life, but in a severe case there may be paraplegia.

LEGER (M.) & BAURY (A.). **Microfilaire sanguicole du Renard africain *Fennecus dorsalis* Gray.** [A Microfilaria from the Blood of an African Fox.]—*Compt. Rend. Soc. Biol.* 1922. Oct. Vol. 87. No. 29. pp. 936–937.

In the living state the worm was capable of very active movements and travelled about freely in the moist blood film. No sheath was recognizable.

In preparations stained by Romanowsky, the parasite measured 200–210 μ by 4·5–5 μ. The clear area at the cephalic end varied from 5–10 μ. There appeared to be three spots constant. The two anterior ones were placed 45–60 μ from the head, while the third, which was rather less pronounced, was about 165 μ from the anterior end. The " central viscus " of MANSON was clearly visible slightly posterior to the middle and measured about 20 μ. The cuticle was finely striated and sometimes a kind of canal opening at a lateral pore could be made out.

No adults were found in the peritoneal cavity.

GABRIELIDES (A.) & GUIART (J.). **La Myose oculaire à " *Oestrus ovis* " à Constantinople.**—*Bull. Acad. Méd. Paris.* 1922. Feb. 28. Vol. 87. No. 9. pp. 253–255.

A case is quoted in which 14 first-instar larvae of *Oestrus ovis* were extracted from the eye of a shepherd.

MUNRO (H. K.). **The Sheep Blow Fly in South Africa.**—Union of South Africa. *Jl. Dept. Agric.* 1922. Nov. Vol. 5. No. 5. pp. 449–456. With 6 text figs.

The scattered references in the literature appear to indicate that blow-flies have been noted as a pest of sheep in South Africa during the past 20 years only, and until recently practically nothing has been done in the way of investigation in South Africa. The bulk of knowledge regarding the flies is the result of Australian investigations. Three species are known in South Africa, *Pycnosoma chloropyga*, Wied., *Pycnosoma albiceps*, Wied., and *Lucilia sericata*, Meig. The first two have a wide distribution in Asia and Africa and the last is a common blow-fly of other countries.

No definite reason can be assigned as to why these flies should take to blowing the wool of sheep as they ordinarily breed in carrion. Possibly it may be due to a natural tendency to change from dead to living food.

Up to the present the two species of *Pycnosoma* have been bred from wool in the coastal region (up to 100 miles from the coast). There appear, however, to be two sub-regions in this belt. Within 10 miles of the sea the flies show little or no tendency to blow wool, but it is said that if sheep are taken 60 miles inland they become blown at once. A possible explanation of this is that sheep purge more inland than near the sea, the fleece becoming more soiled, and possibly more attractive to the flies in consequence. Possibly some climatic condition affects the bionomics of the fly and accounts for the difference. Lucilia has been bred in large numbers from wool from the Free State only.

The appearance of two fly seasons, October and January, may be due to the fact that the fleeces are long at these times and the flies are more troublesome when the wool is long than when it is short. The flies do not disappear between these periods.

Although the matter is a little intricate it has been found possible to identify flies by their maggots.

Details are given of the general morphology of the maggots, and also of the mature flies. There is included a description of *Sarcophaga haemorrhoidalis* (the Grey Flesh Fly) the common blow-fly of meat, which has not been as yet obtained from wool.

QUEENSLAND AGRICULTURAL JOURNAL. 1922. Aug. Vol. 18. No. 2. pp. 102–104. **Report of the Blowfly Committee of the Institute of Science and Industry. Protection of Sheep from Blowflies. II.**

This report contains a description of an effective method of protecting sheep against blow-flies, the essence of which is the saturation of the wool round the breech with a solution of arsenic, the saturation being effected by forcing the solution through a small jet at high pressure.

A solution of commercial white arsenic in soda ash of 0·7 per cent. strength (ascertained by analysis) gave sufficient protection, but solutions of twice that strength were used without ill effects. A single "jetting," as it is called, with this solution gives protection (save in wet weather) for three months. Six weeks protection is the shortest noted.

The machine used is a pump capable of delivering solution under a constant pressure of 60–200 lb. per square inch. The jet is one-sixteenth of an inch, but for dense fleeced sheep three-thirty-seconds is better. A pint and a half is sufficient for a sheep. With a suitably constructed race four men can deal with 3,000 sheep per day.

ROUBAUD (E.). **Les mouches "tsétsés" et les conditions de l'elevage en Afrique Occidentale Française.** [The Tsetse Flies of French West Africa and the Conditions of Cattle Breeding there.]—*Agron. Colon.*, Paris. 1922. July & August. Nos. 55 & 56. pp. 217–223 & 254–262. With 2 plates, 5 text figs., and 1 map. [Ex. *Rev. App. Entomol.* 1922. Nov. Vol. 10. Ser. B. No. 2. pp. 212–214.]

The distribution of Glossina is one of the factors controlling the breeding of cattle in French West Africa The northern areas are more or less safe for herds because of the dry winds blowing from the Sahara. The flies are limited to the more humid areas and in consequence are to be found in the southern portions of the country where the winds from the Sahara are not felt. The cattle-raising areas account for about one-fifth of the whole country. It is noticeable that herds are smaller and are composed of animals of smaller size as one passes southwards. The cattle outside the fly belts are of the large humped type, and are particularly susceptible to trypanosomiasis. Only the large animals are fit for export. The smaller animals of the southern herds are, however, frequently used for transport purposes. They are the only domestic animals which can exist in the zones infested by *G. morsitans*. In two cases successful experiments have been made in importing into other fly infested areas the small trypanosome resistant half wild cattle of the sea and lake coast areas.

Conditions similar to those obtaining among cattle are found among the horses of the territory. Generally their susceptibility to trypanosomiasis is directly proportional to their size. In mid-Dahomey

there is a dwarf race which is the most resistant. The suggestion is made that this race might be used with advantage for the production of mules, for while donkeys cannot be raised in the Glossina belts mules show a greater degree of resistance. Algerian mules have not the resistance of those bred locally.

The larger races of sheep and goats cannot live in the fly areas, and it appears to be probable that the smaller races in the fly zones owe their freedom from trypanosomiasis more to the fact that they live almost entirely within villages where they are protected from flies than to natural resistance.

Pigs appear to be the least susceptible of the domestic animals to trypanosomiasis, but Mahommedan prejudices prevent their rearing in any numbers.

ROUBAUD (E.). **Les mouches tsétsés dans l'Ouest Africain. Distribution géographique—Histoire—Rôle pathogène** (à suivre). [The Tsetse Flies of West Africa—Geographical Distribution, History, and Pathogenicity. (To be continued.)]—*Ann. Inst. Pasteur.* 1922. Oct. Vol. 36. No. 10. pp. 720–728. With 1 map.

A paper of this nature does not lend itself to abstraction and must be consulted in the original by those interested.

PARROT (L.). **Présence de** *Phlebotomus perniciosus* **Newstead dans la region parisienne.** [The Presence of *Phlebotomus perniciosus*, Newstead, in the Neighbourhood of Paris.]—*Bull. Soc. Path. Exot.* 1922. Oct. Vol. 15. No. 8. p. 694.

The author records the occurrence (one specimen caught) of this fly west of Paris.

CHEYSSIAL (M. A.). **Experimentation de la Methode de d'Herelle en Guinée française pour la destruction des Acridiens.** [The Application of d'Herelle's Method for the Destruction of Locusts in French Guinea.]—*Bull. Soc. Path. Exot.* 1922. Oct. Vol. 15. No. 8. pp. 762–764.

The original culture used was furnished by D'HERELLE and was labelled "Coccobac. acridiorum, Souche V. Yucatan."

The virulence of the culture was exalted by passages through locusts until it was capable of causing death in from 10–12 hours. It was then alternately passed through locusts and broth cultures and after 20 passages diarrhoea was produced in three hours and death in eight.

The first experiment was carried out in the hospital grounds at Ballay with the result that, in spite of a hurricane of wind and a fall of more than an inch of rain, complete destruction of locusts resulted. The mortality spread to other grounds outside the hospital which were also cleared of the insects.

Successful experiments were also carried out in a number of other places.

It was observed that ants' nests were not affected.

The type of locust concerned in the experiments has not been determined definitely but it is probably *Stauronautus marocanus* or *caloptenus*. The wings of this species are not adapted to flying.

A short account of the life history and habits of the locust are included in the paper.

DAWE (M. T.). **Efwatakala Grass** (*Melinis minutiflora*) **as a Means for the Control of the Tsetse Fly.**—*Tropical Life.* 1922. May. Vol. 18. No. 5. pp. 69–71. With 1 fig.

This grass has a strong odour which might act as a repellent to the flies, and further, the leaves are covered with glandular hairs which contain a viscid oil which it is thought is objectionable to some insects. It is belief in this property which leads to the use of the grass as bedding for animals. The grass is largely used in South America for grazing cattle, and it is said that ticks cannot live in it. It is believed that cattle moved from such grazing are not attacked by ticks for some time afterwards. It is also thought that the fly producing cattle warbles there is disappearing with the extended cultivation of the grass.

The grass grows easily and rapidly on moist or dry soil, and occurs over a wide area in Africa which extends from the South of the Sahara to Natal.

CUNLIFFE (N.) & NUTTALL (G. H. F.). **Some Observations on the Biology and Structure of** *Ornithodorus moubata.* **(Murray.)**—*Parasit.* 1921. Nov. Vol. 13. No. 4. pp. 327–347. With 1 plate & 5 text figs.

GORDON (R. M.) & EVANS (A. M.). **Mosquitoes collected in the Manáos Region of the Amazon.**—*Ann. Trop. Med. & Parasit.* 1922. Oct. 18. Vol. 16. No. 3. pp. 315–338. With 1 plate & 10 text figs.

GOBERLET (J. E.). **Three New Species of Holostomidae.**—*Jl. Parasit.* 1922. Sept. Vol. 9. No. 1. pp. 7–13. With 2 plates.

GREIG (D. M.). **Myiasis oestrosa: Being the Occurrence in the Human Subject of the Larva of** *Hypoderma bovis.*—*Edinburgh Med. Jl.* 1922. June. Vol 28. No. 6. pp. 258–266.

INGRAM (A.) & MACFIE (J. W. S.). **West African Ceratopogoninae. Part II.**—*Ann. Trop. Med. & Parasit.* 1922. Oct. 18. Vol. 16. No. 3. pp. 243–282. With 24 text figs.

MAPLESTONE (P. A.). **Notes on Australian Cestodes. VI.** *Schizotaenia cacatuae,* **sp. nov.**—*Ann. Trop. Med. & Parasit.* 1922. Oct. 18. Vol. 16. No. 3. pp. 305–310. With 5 text figs.

POMMÉ & SABAGH (A.-K.). **Un cas de Bilharziose vésicale à Damas traité par l'antimoine en injections intraveineuses.** [A Case of Vesicular Bilharziosis at Damas treated by Intravenous Injections of Antimony.]—*Bull. Soc. Path. Exot.* 1922. Oct. Vol. 15. No. 8. pp. 695–698.

RODHAIN (J.). **Sur une Filaire parasitant le tissu conjunctif sous-cutané de** *Agama colonorum* **Dunv. et Bibi au Congo Belge.** [A Parasitic Filaria of the Subcutaneous Connective tissue of *Agama colonorum* in the Belgian Congo.]—*C.R. Soc. Biol.* 1922. July–Sept. Vol. 87. No. 28. pp. 807–810. With 1 text fig.

URICH (F. W.), SCOTT (H.), & WATERSTON (J.). **Note on the Dipterous Bat Parasite,** *Cyclopodia greeffi* **Karsch, and on a New Species of Hymenopterous (Chalcid) Parasite bred from it.**—*Proc. Zool. Soc., London.* 1922. June. No. 2. pp. 471–477. With 1 fig.

BACTERIAL DISEASES

VAN SACEGHEM (R.). **La pneumonie contagieuse des chèvres au Ruanda.** [Contagious Pneumonia of Goats in Ruanda.]—*Ann. Soc. Belge. Méd. Trop.* 1922. Vol. 2. No. 1. pp. 121–124.

According to the author the method of infection is by ingestion of contaminated food or water. Enteritis is sometimes a complication.

He has isolated a coccobacillus, with which he has transmitted the disease experimentally. The cultural characters are described. The organism differs from the Pasteurella described by HUTYRA and MAREK as the cause of contagious pneumonia of the goat in that it is motile, and van Saceghem classes it as a Salmonella. Cultures retain their vitality for months, but lose virulence.

With cultures of different degrees of virulence a peracute, acute, and chronic form of the disease have been produced.

Sheep are non-susceptible.

DONATIEN (A.). **El Ghedda. Septicémie hémorrhagique des dromadaires.** [El Ghedda. Haemorrhagic Septicaemia of the Dromedary.]—*Arch. Insts. Pasteur de l'Afrique du Nord.* 1921. Vol. 1. No. 3. pp. 242–249.

The outbreak described occurred among the camels of a tribe of nomads and the mortality was nearly 50 per cent.

The onset was sudden and there was marked fever, lachrymation, complete loss of appetite and arrest of rumination. There was almost invariably enlargement and inflammation of the prepectoral glands. Not infrequently these glands suppurated and discharged pus.

In some cases there was profuse diarrhoea of a black colour. Abortion almost invariably occurred. This was looked upon as a good sign by the owners. Rising and moving when up were obviously accompanied by pain. In fatal cases death occurred in from 2–8 days, but it was exceptional to see a case actually terminate fatally, because animals which appeared to be likely to die were killed for food.

In cases which recovered convalescence was prolonged.

At the post-mortem the lesions found vary with the case. The muscles are discoloured and friable, this being particularly the case with the heart, and haemorrhages are found in all parts of the muscular tissues. As a rule only one of the prepectoral glands is involved. Various stages of the gland lesion may be encountered. The earliest phase is the presence of ecchymoses. In later phases the whole surface of the gland is red, and still later points of suppuration are observed. Finally the whole gland may be converted into pus. None of the other body glands was observed to show suppuration, although they presented evidence of acute haemorrhagic adenitis.

In the abdomen the constant lesion is found in the liver. This shows evidence of degeneration, and histological examination shows that the type of lesion present is variable.

In cases which have shown black diarrhoea there is intense enteritis of the small intestine. The spleen appears to be normal. There is an excess of clear fluid in the peritoneum. As a rule there are no lesions in the thoracic cavity, but in one case there was acute pneumonia along the lower border of the lungs, the lesion showing a tendency to suppuration. The bronchial and mediastinal glands in this case were

suppurating. Histological examination revealed the presence of small "toxi-infectious" nodules composed of about a score of cells in the liver lobules, granulo-fatty degeneration of the liver cells, and later the cells in the centre of the lobules are found to have lost their plasma, and the nuclei are pycnotic.

The disease appeared to favour the spread of mange among convalescents.

Under natural conditions only camels are attacked, but certain races of animals, *e.g.*, the Saharan and the Tell camels, appear to be resistant.

Trypanosoma berberum was never found. Attempts to infect guinea-pigs failed, as did also rabbit inoculations.

A young camel (Chaamba tribe) failed to respond in any way to a subcutaneous inoculation with material from a suppurating prepectoral gland and to the administration per os of 100 cc. of urine from a diseased animal.

A small bacillus was isolated from the gland material used, but no evidence of its virulence by inoculation or of its connection with the disease by agglutination could be established.

DONATIEN (A.) & LARRIEU (M.). **Nouvelle epizootie de Ghedda à M'Raier (Sahara) en 1921.** [A New Outbreak of Ghedda (Haemorrhagic Septicaemia of Dromedaries) at M'Raier (Sahara) in 1921.] —*Arch. Insts. Pasteur de l'Afrique du Nord.* 1922. Sept. Vol. 2. No. 3. pp. 316–319.

In this outbreak about 10 per cent. of the total number (1,800) were attacked, and of these 63 died. Death took place on the 5th or 6th day after the first rise of temperature.

The symptoms presented were very few. There was a rise of temperature, loss of appetite, cessation of rumination and constipation. In some cases there was enlargement of the prepectoral and superficial inguinal glands.

Contrary to what one of the authors observed in an earlier outbreak, recovery when it occurred was very rapid.

The lesions in fatal cases may be severe or slight. The lesions were those of a haemorrhagic septicaemia, but particular mention is made of haemorrhagic nephritis. The muscles and glands showed the lesions described in the previous paper on the subject.

The difference in the severity and mortality of the two outbreaks is put down to the different condition of the animals. In the earlier outbreak the dromedaries were in a condition of poverty.

Attempts were again made to isolate the causal organism, but without success.

CRAIG (J. F.) & KEHOE (D.). **An Outbreak of Contagious Abortion in an Irish Dairy Herd.**—*Jl. Comp. Path. & Therap.* 1922. Dec. Vol. 35. No. 4. pp. 256–273.

This paper contains an account of an Irish dairy herd of some 30 animals in which contagious abortion made its appearance, and the observations made following the application of live vaccine. The herd being a utility herd, the whole of the animals were not under observation for the entire period of three years during which the observations were made. Only 10 of the original animals remained at the end of the period.

It was not practicable to have controls in a case of this kind, but in view of the fact that no abortions occurred in the herd after vaccination,

the authors conclude that a marked degree of immunity was established. With regard to sterility the authors think that some of the animals were benefited by the vaccination, while in others the reverse was the case.

The immunity appeared to last for two years and then broke down in some of the original members of the herd. They advise that in herds which have been vaccinated the vaccination should be repeated annually. The authors do not think there is much risk of creating carriers by using living vaccine, and they imply that the vaccine is less virulent than the organisms which are responsible for natural infection. The value of the agglutination test for the diagnosis of the disease is confirmed, but it is noted that while a positive result is almost invariably obtained before abortion occurs, there are occasional cases in which abortion precedes the development of agglutinins in the blood.

Confirmation is also forthcoming of the fact that once a cow has become infected the infection may persist for years.

The defects of the method of vaccinating are discussed. The first is the impossibility of immediately applying vaccination to a whole herd when the disease makes its appearance, it being unsafe to inject in-calf animals. The second is that by vaccination the disease is not eradicated. It is the effects of the disease, and not the disease itself, which are controlled.

BEVAN (Ll. E. W.). **The History, Control, and Treatment of Infectious Abortion of Cattle.**—*Rhodesia Agric. Jl.* 1922. Oct. Vol. 19. No. 5. pp. 554–568.

The principal interest of this paper lies in the author's discussion of the question of vaccines, but owing to the controversial nature of the subject it cannot be abstracted satisfactorily. The "devitalized" vaccine, which the author prepares and uses in the field, is considered in the light of more recent statements from other countries, and notably from the United States, and the conclusion arrived at is that, while the method is somewhat empirical, it has yielded results which warrant its use, pending further investigation, in preference to living vaccine.

GILTNER (W.), HUDDLESON (I. F.) & TWEED (R. L.). **The Role of the Udder and its Secretion in Bovine Infectious Abortion.**—*Jl. Amer. Vet. Med. Assoc.* 1922. Nov. Vol. 62. No. 2. pp. 172–178.

This paper is a review of existing knowledge on the subject, and the substance of the authors' summarization of this is as follows: there is no positive evidence to warrant the assertion that milk from an udder containing *B. abortus* is an important factor in the spread of the disease. Animals which carry the organism in their udders and which do not abort are probably the important source of infections, as such animals have been found repeatedly to pass out the organisms in uterine exudates during parturition.

The paper includes a valuable bibliography.

COTTON (W. E.). **The Character and Possible Significance of the Bang Abortion Bacillus that attacks Swine.**—*Jl. Amer. Vet. Med. Assoc.* 1922. Nov. Vol. 62. No. 2. pp. 179–192.

The author describes in general terms the results obtained from the examination of six different strains of *B. abortus* causing abortion in pigs, and comes to the conclusion that these while resembling each other

more or less closely differ markedly from all the strains which have been isolated from cattle. One of the most important differences is in the pathogenicity for the guinea-pig. Bovine strains appear to be incapable of producing distinct or even recognizable microscopic lesions in that species, while strains isolated from pigs possess marked pathogenic properties. The six pig strains examined varied among themselves with regard to the severity of the lesions produced and the frequency with which certain of them appeared, but there was a general agreement between all of them. Lesions in the bones and orbits, the latter causing protrusion of the eyeball and destruction of sight, are of frequent occurrence when pig strains are used.

Feeding experiments with swine indicated that passage through guinea-pigs lowered the virulence for the sow, but that passage through the pig again restored it.

Many attempts have been made to infect pregnant sows by feeding them with strains of abortion bacilli of bovine origin, but these have invariably failed.

A small number of experiments are recorded in which pregnant cattle were inoculated with the swine strain. It was not possible to obtain evidence of infection in all cases.

Experiments are being carried out with a view to ascertaining whether swine strains are capable of causing abortion in herds which have acquired immunity against the ordinary cattle strains. The work is not yet complete, but results obtained appear to indicate that a recrudescence of abortion may occur.

Lasting infection of boars was only produced by direct inoculation into the testicles. Boars so inoculated allowed to run with sows failed to infect the latter as they farrowed normally and their blood was negative to the agglutination test.

HAGAN (W. A.). **Studies on the Disease of Guinea-pigs due to *Bacillus abortus*.**—*Jl. Exp. Med.* 1922. Dec. Vol. 36. No. 6. pp. 697–709.

The experiments recorded in this paper were carried out with a strain of bovine origin less than six months previously In experiments designed to ascertain the minimum infecting dose it was found that 100 bacilli were sufficient to infect in the great majority of cases. Occasionally guinea-pigs with an abnormally high degree of resistance were encountered. The dose administered did not appear to affect the final result of the inoculation, but with small doses the infection took a slower course.

The majority of the guinea-pigs were not kept under observation for more than six months, but judging from the results of agglutination and the results of culture experiments at the end of that period, it would appear that the infection tends to die out.

Charts are given showing variations of virulence encountered as a result of passage through guinea-pigs.

Although many guinea-pigs, infected and normal, were kept together in large pens during the course of the experiments, in no case was natural infection contracted. But in one case where a male was placed with infected females it became infected, yielded positive agglutination tests and its spleen and epididymis yielded cultures. One of the females was found to have an abortion abscess in its uterus with discharge passing into the lumen of the organ.

It was computed that the dose necessary to infect guinea-pigs by ingestion was 100 million times the dose necessary by inoculation.

HAGAN (W. A.). **The Value of Heat-Killed Cultures for the Prevention of the *Bacillus abortus* Inoculation Disease of Guinea-pigs.**—*Jl. Exp. Med.* 1922. Dec. 1. Vol. 36. No. 6. pp. 711–725. With 4 text figs.

These experiments were undertaken with a view to studying the mechanism of immunity in this disease, it being possible with this species to avoid the complexities of the subject in connection with cattle abortion. The danger of inferring from one species to another is recognized.

In view of the results of previous work on similar lines and of investigations in connection with the natural disease of cattle the experiments were planned on a quantitative basis in an effort to detect immune processes which might not be sufficient to afford complete protection. The factors taken into consideration in judging results were (*a*) changes in body-weight; (*b*) differences in agglutinin curves; (*c*) extent and character of the lesions, particularly in the spleen; and (*d*) the number of abortion bacilli cultivable from the spleen.

The culture used was a typical bovine strain isolated by guinea-pig inoculation. The age of the culture is not given, but it is stated that it grew readily on plain veal infusion agar "provided the cultures were hermetically sealed."

Twelve guinea-pigs of similar size and age (females) were given weekly 1 cc. of a suspension of killed bacilli intraperitoneally. This was continued for six weeks. Three weeks later, when the agglutination titres began to fall they (two being excluded as controls), along with ten uninjected females of similar weight and age, were inoculated intraperitoneally with definite dilutions of a culture of the same strain as that used for the immunizations. The animals were bled regularly at intervals of a week and agglutination tests made. They were killed in groups at three, six, nine, and twelve weeks.

It was noted that the non-immunized animals showed greater increases in weight than the immunized ones before the infecting doses were given, but that after infection the position was reversed. On the total experiment the gain in weight of the two groups was about the same. Two guinea-pigs kept along with the others received neither immunizing nor infecting doses, and these acted as controls. These animals showed a markedly greater increase in weight than any of the others.

Agglutination tests showed that in this respect there was practically no difference between the two groups in response to the infecting dose. The size of the infecting dose made little difference to the response.

All the guinea-pigs became infected, showing that the treatment failed to prevent the disease. It was noted that the enlargement of the spleen was almost invariably much greater in the non-immunized group, and it appeared that this was referable to a delay only in the process of development of the lesions, not to any inherent difference in their nature, Enlargement of the glands was also more marked in the non-immunized than in the immunized.

A striking lesion occurring in the non-immunized animals was that previously described by SMITH and FABYAN, viz., cellular infiltration followed by sclerosis.

An appreciably larger number of bacilli were present in the spleens of non-immunized animals as compared with the immunized.

The conclusions are that guinea-pigs cannot be rendered immune by means of cultures killed by heat, but that the progress of the disease may be delayed by such treatment.

In an appendix the technique of the method used for the agglutination tests and the method of determining the number of bacilli in the spleen are given.

In connection with the former it is stated that carbolic acid was not used as preservative for the antigen, as it "induces a permanent cloudiness of the suspension, which renders the reading of partial reactions difficult."

HAGAN (W. A.). **The Susceptibility of Mice and Rats to Infection with** *Bacillus abortus*.—*Jl. Exp. Med.* 1922. Dec. 1. Vol. 36. No. 6. pp. 727–733.

Previous experiments have been carried out on these lines, but with rather large doses. The present work has been done with a view to providing answers to the questions as to whether rats and mice are sufficiently susceptible to small doses to be of value for diagnostic purposes and whether wild rats are sufficiently susceptible to infection by ingestion to make them a possible factor in the transmission of the disease among cattle.

Mice were inoculated in pairs with decreasing doses of a definite emulsion and the results indicated, as shown by cultivations from the spleen, that mice compare favourably with guinea-pigs in susceptibility to inoculation. The suggestion is made that they may serve as an inexpensive substitute for guinea-pigs in diagnostic work. Attempts were made to infect white and grey rats and white and grey mice by feeding, either with cultures or with infected organs. All attempts failed with the exception of two. One white and one grey rat became infected as a result of ingesting a large amount of culture.

VINCENT (H.). **Sur la prophylaxie de la fièvre ondulante (fièvre de Malte ou méditerranéenne).** [Prophylaxis against Undulant (or Malta) Fever.]—*Rec. Méd. Vét.* 1922. Oct. 15. Vol. 98. No. 19. pp. 557–563.

With a vaccine containing fourteen strains of *M. melitensis* and two of *M. paramelitensis* the author has been able to confer immunity upon a number of goats. The protected goats were tested by intravenous inoculations. No details of the preparation, etc., of the vaccine are given.

The method has been used in practice in about 200 cases. The only evidence of reaction to the vaccine is a rise of temperature (sometimes accompanied by diarrhoea) a few hours later.

SOUTH AFRICAN INSTITUTE FOR MEDICAL RESEARCH. **Annual Report for the Year ended Dec. 31, 1921.** 1922. Johannesburg.

Undulant Fever.—Ten positive agglutinations were obtained. The localities from which the sera came were as follows: Graff-Reinet, Calitzdorp, Kimberley (2), Johannesburg (2), Kuruman, Hopetown, Potchefstroom, and Shabani.

OKUDA (K.). **On a Soluble Toxin produced by** *Bacillus chauvoei*. —*Jl. Jap. Soc. Vet. Med.* 1922. Sept. Vol. 1. No. 3. pp. 198–199.

The author grew the bacillus in broth containing 10 to 20 per cent. of fresh blood (of any kind). The toxin content reaches its maximum

in two to four days, but it then declines. The addition of 0·5 per cent. of anhydrous sodium sulphite to the broth increased yield of toxin. 0·1 cc. of filtrate was sufficient to cause death in guinea-pigs. The symptoms shown were coughing, dyspnoea and suffocation. Post-mortem examination revealed haemorrhages in the subcutaneous tissue, muscles, lungs, serous membranes and blood stained exudates in the serous cavities. Animals which survived were resistant to subcutaneous inoculation with culture, but this immunity was less strong than that produced by the subcutaneous injection of toxin.

FUTAMURA (H.). **Studies on Bovine Influenza.**— *Jl. Jap. Soc. Vet. Sci.* 1922. Sept. Vol. 1. No. 3. pp. 133–140. With 1 plate.

Although this disease may be seen at all seasons of the year, it is usually more prevalent during late winter and early spring. Animals of all ages and breeds are attacked, but it is more fatal in calves than in adults.

The initial symptoms are those of an acute fever, and the temperature rises until the second or third day and then falls. Catarrhal conjunctivitis is very constant, as is also a nasal discharge which becomes muco-purulent. Salivation is marked and the saliva is stringy. Occasionally blood is mixed with the diarrhoeic faeces.

In pregnant cows from the fifth month abortion is certain to occur. In milking cattle the milk supply is reduced to a half or even ceases altogether. Bulls become incapable of effecting coitus. The incidence in a herd may be up to 50 per cent., but is usually lower than that. The mortality from the disease is about 3 per cent., but sometimes animals have to be destroyed on account of sequels to the disease.

The principal lesions are gelatinous oedema in various parts of the body, hepatization of the lungs, engorgement of the liver and kidneys, and congestion of the alimentary mucous membrane. The spleen is not affected.

According to the records inoculation of calves with materials from animals dead of the disease has failed to produce it, but a bipolar organism has been isolated from a number of tissues, which it is considered may be the cause of the condition.

Mice and rabbits were susceptible to infection with this organism, but it was non-pathogenic for guinea-pigs and pigeons. Sheep and cattle could be infected. The former died within 12–36 hours without developing definite symptoms. In two cases calves developed symptoms but recovered, and in a third, which was inoculated intravenously, typical symptoms were developed and death took place.

A feeding experiment with a cow resulted only in loss of appetite with a slight rise of temperature followed by recovery.

Agglutination and complement fixation tests indicated the presence of antibodies in the serum.

Serum from a hyperimmunized ox yielded irregular results in the treatment of the disease.

JONESCU (A. P.). **Un cas de Charbon chez le chien.** [A Case of Anthrax in a Dog.]— *Arch. Veterinara.* 1922. Vol. 16. No. 4. pp. 168–172.

The dog referred to in this article was one of a series of animals infected from the same source, namely, an ox which had died of anthrax. The owner of the animal developed malignant pustule, a pig became ill and was killed, and a sheep also died.

A definite diagnosis was arrived at in the case of the man only, apart from the dog. While no definite diagnosis was made in the case of the ox, the lesions found appear to have been sufficient to establish it as a case of anthrax.

The meat of the pig had been pickled before it was submitted for examination and gave a negative precipitation test. The sheep was buried immediately after death and was not examined.

The dog had eaten parts both of the ox and the pig. No symptoms were observed until a few hours before death, when the animal was dull and showed difficulty in breathing. There was some swelling of the submaxillary region, and the dog vomited and passed liquid blackish faeces. Post-mortem showed marked congestion of all the organs, the blood black and fluid, ecchymoses on the epicardium, the spleen enlarged but its pulp not diffluent. The kidneys showed necrotic centres and on section evidence of an acute nephritis, superposed on a chronic nephritis. Microscopically the bacillus could be detected in all the organs and it was recovered culturally.

The cultures were used for experimental inoculations and from these it was found that the bacillus was virulent for rabbits, grey and white mice, and dogs, but non-virulent for rats and cats.

HOLMAN (W. L.). **Studies on Anthrax Infection.**—*Proc. Soc. Exp. Biol. & Med.* 1922. Vol. 20. No. 1. pp. 60–61.

Guinea-pigs were fed with cultures of anthrax placed in gelatin capsules, in order to avoid the possibility of infection in mouth. Virulent anthrax spores were found in the faeces up to the 7th day. Two weeks later the animal was inoculated subcutaneously and died. This experiment was repeated with similar results. Spores were found in faeces for varying times up to the 10th day.

A question arose as to whether the amount of loose tissue at the seat of a subcutaneous inoculation has any bearing on the question.

Three guinea-pigs were injected each with about 50 spores in $\frac{1}{20}$ cc. subcutaneously on the abdomen and three subcutaneously on the ear. The three former survived while two of the latter died. The local reaction was very slight and would not have indicated the seat of operation, as it was on the side of the neck in one and along the trachea in the other.

BALTEANO (L.). **L'infection charbonneuse et l'immunité anticharbonneuse chez les lapins et les cobayes.** [Infection with Anthrax and Anti-Anthrax Immunity in Rabbits and Guinea-pigs.]—*Ann. Inst. Pasteur.* 1922. Nov. Vol. 36. No. 11. pp. 805–811.

The author has repeated BESREDKA's experiments and confirms his results.

RABAGLIATI (D. S.). **A Case of Tetanus in a Bull.**—*Jl. Comp. Path. & Therap.* 1922. Dec. Vol. 35. No. 4. pp. 286–291. With 1 text fig.

The author draws attention to the few records of the occurrence of tetanus in cattle that have appeared in veterinary literature during the last 20 years, and concludes that it must rarely come under observation.

The present case occurred in a six-year-old Upper Egyptian bull. The animal had been used for the production of anti-rinderpest serum at Abbassieh, but as he had become dangerously vicious it was decided

to castrate him. As there had not been a case of tetanus at the institute, to the author's knowledge for 18 years, the possibility of its occurrence was not thought of. It is, however, noted that during the war the premises were used as a remount depot and it is possible that a case may have occurred there then.

The operation was performed on July 10, and up to the 23 nothing abnormal was observed. On that day he was off his feed. The castration wounds had completely healed by this time. The following day there was complete loss of appetite, and no faeces were passed. On the four following days purgatives and stimulants were given, but without effect. On July 31 stiffness was noticed and the hind legs were held outwards when the animal turned. There was slight tympanites, and the membrana nictitans was protruded when the animal was approached. Palpation of the muscles showed that they were very hard. From this time onwards clear symptoms of tetanus were observed. In spite of the stiffness, however, the bull was able, with considerable difficulty, to get down and rise. It was observed that the tail was not moved jerkily as it is in equines affected with tetanus. The tympanites never became dangerous, but was present most of the time. All food was refused until August 16.

Handling the patient did not give rise to the spasms seen in affected horses. Save for slight fluctuations the temperature did not show any distinct rise until August 4, when it was 104° F. It remained above normal during the latter part of the attack and for some time afterwards.

The symptoms began to subside on August 13 and the animal began to eat, and ten days later all symptoms of tetanus had disappeared. Tendonitis and synovitis of both forelegs developed, probably as a result of prolonged standing, but these cleared up with suitable treatment in a few days and recovery became complete.

Two intravenous injections of four litres of Tyrode's solution were given on July 31 and August 2, but they were discontinued on account of the inadvisability of casting the bull. Six subcutaneous injections of magnesium sulphate were given each of 30 g. in 200 cc. These produced painful swellings and were not persisted with. Frequent enemata were given and the patient fed per rectum with eggs and milk.

It is not claimed that the treatment effected a cure, as further observations are necessary.

PFEILER (W.) & GOERTTLER (V.). **Ueber den Nachweis der Infektionserreger bei Rauschbrand und rauschbrandähnlichen Erkrankungen durch Untersuchung des Knockenmarkes.** [The Detection of the Bacillus of Blackquarter and the Causal Organisms of Similar Diseases in Bone Marrow.]—*Arch. f. wissench. u. prakt. Tierheilk.* 1922. Aug. 17. Vol. 48. No. 2. pp. 145–149.

The authors advise that in suspected cases of blackquarter bones containing marrow should be sent to the laboratory for diagnostic purposes, as the organisms are more likely to be present in a state of purity.

SEDDON (H. R.). **Impaction Paralysis of Cattle.**—*Jl. Agric. Victoria.* 1922. Sept. Vol. 20. No. 9. pp. 570–573.

This condition has been known for many years in Victoria, and it has been realized that the impaction is a result and not a cause of the

condition. As a result of recent investigations it has been discovered that the paralysis of the muscles of mastication and deglutition along with muscular walls of the alimentary tract is caused by a bacterial toxin.

The organism isolated in Australia was obtained from a bone of an animal dying of the disease, and it therefore appears to be probable that the condition is allied to that observed in South Africa. The prompt destruction of carcasses of animals dead of the disease and the provision of suitable "licks" has led to a marked reduction in the number of cases in Victoria within recent years.

It appears to be probable that bones from infected animals are not the only source of infection, but that the bones of animals dying from any cause may become invaded by the organism producing the toxin and thus become a source of danger. In support of this view the author states that he isolated a toxin producing organism apparently identical with the one discovered in Victoria from some sheep bones from Western Australia which had been buried for two years. In a manuscript note on the copy of the Journal from which this abstract is made the author states that the organism isolated from these sheep is shown by toxin antitoxin experiments to be *B. parabotulinus.*

Treatment is not very practicable for the reasons that the paralysis hinders or prevents swallowing and that toxin has been absorbed by the time symptoms are observed.

ANDERSON (C. M.). **Übertragung von Paratuberculose auf Versuchstiere.** [The Transmission of Johne's Disease to Experimental Animals.]—*Arch. f. wissench. u. prakt. Tierheilk.* 1921. Aug. Vol. 47. No. 1. pp. 77–84. [Journal received Sept. 8, 1922.]

The starting point of the author's experiments was a rabbit which was infected with Johne's disease and which was reported by BANG at the Tenth International Veterinary Congress, 1914. Four rabbits were inoculated subcutaneously with an emulsion of mesenteric gland and intestinal mucous membrane, while two others were fed with the same material mixed with bran. Five of the rabbits survived for about two years, but when killed showed no evidence of infection.

Later two rabbits were inoculated subcutaneously and two intravenously with a pure culture of a strain derived from BANG's rabbit. At the same time four guinea-pigs were inoculated subcutaneously and a fowl intravenously.

One of the rabbits inoculated intravenously died five months later and showed typical lesions containing acid-fast bacilli. The lesions and bacilli were confined to the intestine and its glands.

The remaining three rabbits were killed a year after inoculation. The one inoculated intravenously and one of these done subcutaneously showed typical lesions. The fourth rabbit and the guinea-pigs and fowl showed no evidence of infection.

It would appear that the passage through the goat (BANG's case) had impressed characters on the bacilli which rendered it pathogenic for the rabbit.

Five further rabbits inoculated subcutaneously and intraperitoneally with bovine strain which had been under cultivation failed to become infected.

In December, 1916, three rabbits were inoculated intravenously with an emulsion of mucous membrane from a heavily infected cow. One of the rabbits died three months later and showed typical lesions.

Bacilli were present in immense numbers. It is remarked that this rabbit, like BANG's original rabbit, had been severely bitten by the others.

One of the remaining two rabbits was found to be healthy when killed three months after inoculation, and the other showed marked lesions of the intestine, but bacilli were scantily present.

The author believes that virulence is lost under artificial cultivation.

PANISSET (L.) & VERGE (J.). **La réaction de fixation, dans l'entérite chronique hypertrophiante des bovidés, au moyen des antigènes tuberculeux.** [Fixation Tests in Johne's Disease with Antigens derived from Tubercle Bacilli.]—*Rec. Méd. Vét.* 1922. July 30. Vol. 98. No. 14. pp. 321–325.

The tests have been carried out with serum from six animals. Three of the animals failed to react to the intradermal tuberculin test and when killed were found to be free from tuberculosis; one which also passed the same test is still alive and shows no symptoms of tuberculosis; and the other two were calves inoculated with *Bacillus phlei* subcutaneously. In a footnote the authors state that VALLÉE and RINJARD are publishing an account of the manner in which *B. phlei* may be rendered pathogenic.

Two types of antigen have been used: the alcoholic extract devised by BOQUET and NÈGRE and BESREDKA's egg antigen. The technique was that of CALMETTE and MASSOL, in which varying doses of dilute complement are first titrated against fixed quantities of antigen and serum. The haemolytic system was sheep corpuscles and horse anti-sheep serum. In every case clearly cut positive results were obtained.

These results confirm those obtained by other methods which indicate the non-specific nature of the complement fixation reaction as regards bovine tuberculosis.

NAKAMURA (N.). **Experimental Studies on Avian Diphtheria.**—*Jl. Jap. Soc. Vet. Sci.* 1922. Sept. Vol. 1. No. 3. pp. 123–120. With 2 plates.

In the course of his experiments the author obtained results indicating that the disease is more easily transmitted with materials from recent lesions than from those of longer standing. He has isolated a coccobacillius from a series of cases and, when this organism could not be detected in older lesions, has been able to demonstrate the presence of antibodies in the serum by means of the complement fixation test.

Morphologically and in its staining reactions the organism appears to approximate to the bacillus of fowl cholera. It gives, however, a growth on potato.

A minute dose caused death of pigeons and rabbits in 24 hours. At the seat of inoculation there was more or less extensive suppurative infiltration and general congestion of the organs. The infection was generalized.

"With pigeons injected with smaller doses a characteristic croupo-diphtheritic inflammation developed 8–14 days before death. In these cases the organism was demonstrated only by developed local lesions mixed with other organisms, but not in the heart blood, liver or spleen."

By feeding experiments and by rubbing scarified oral mucous membrane with pure cultures typical mouth lesions were obtained. Similarly typical lesions of the eye followed the installation of pure cultures.

The author was successful in producing protective sera from goats and sheep, but this serum was of no value in advanced cases.

SAKAMOTO (K.). **A Study in Active Immunisation against Fowl Cholera.**—*Jl. Jap. Soc. Vet. Med.* 1922. Sept. Vol. 1. No. 3. pp. 151–154.

Vaccines prepared from cultures whether attenuated or killed by heating, drying, shaking or disinfectants were found to be of little or no value.

Good results were obtained when the vaccine was prepared as follows: 48-hour cultures upon agar were treated with 1 per cent. caustic potash (8 cc. per tube) and left for 48 hours at room temperature. This was neutralized with 1 per cent. acetic acid, which resulted in the formation of a white precipitate. This was washed and dissolved in 1 per cent. sodium carbonate (1·5 cc. per tube). This in doses of 0·1 to 1·0 cc. protected pigeons against large doses of virulent culture.

KOON (G. H.) & KELSER (R. A.). **The Control of Equine Infectious Abortion in the United States Army.**—*Jl. Amer. Vet. Med. Assoc.* 1922. Nov. Vol. 72. No. 2. pp. 193–196.

MOORE (E. V.) & MCAULIFF (J. L.). **Haemorrhagic Septicaemia in Cortland County.**—*Cornell Veterinarian.* 1922. Oct. Vol. 12. No. 4. pp. 289–294.

SEDDON (H. R.). **The Specific Identity of** *Bacillus parabotulinus.*—*Jl. Comp. Path. & Therap.* 1922. Dec. Vol. 35. No. 4. pp. 275–280.

MYCOTIC DISEASES.

MOODIE (R. L.). **Actinomycosis in a Fossil Rhinoceros.**—*Jl. Parasit.* 1922. Sept. Vol. 9. No. 1. p. 28.

The specimen upon which the diagnosis was based was the whole of the right ramus of the lower jaw and part of the left of a rhinoceros. The lesion involved the alveolus of the left large incisor. A portion only of the lesion is in existence. This shows that the exterior is relatively firm while the interior is "mealy in appearance with numerous necrotic sinuses." The sinuses channel out to the surface of the jaw and one had formed into an alveolus. Apparently near the centre of the mass nearly all traces of osseous structure were lost, due to the destructive activity of the ray fungus. There is no indication of healing, and doubtless the infection was active at the time of death of the animal, suggesting that the infection then, as now, was of long duration.

AYYAR (V. K.). **Snoring Disease in Cattle.**—*Madras Veterinary Jl.* 1922. July. No. 15. (No. volume number.) pp. 2–7.

The author states that he has detected a ray fungus as the cause of this condition, which is very prevalent in Southern India. Further publication of details is promised.

ROGER (J.). **Au sujet des Plaies d'Été.** [Summer Sores.]—*Rec. Méd. Vét.* 1922. Oct. 30. Vol. 98. No. 20. pp. 430–431.

By sowing out on SABOURAUD's agar material scraped from summer sores, the author has succeeded in cultivating a yeast which gives a creamy growth of a pink (" shrimp ") colour, and a spore which shows thickenings of its envelope, giving the appearance of a cog-wheel. The latter yields a black dusty growth in primary culture. The first subculture is white. In the second the colonies have haloes and their surface is irregular. The third subculture is comprised of a wrinkled growth powdered over with black, and the fourth resembles the primary culture.

In broth there is a mycelial growth on the surface and the liquid assumes a greenish tint. Subcutaneous inoculation of laboratory animals has not caused infection.

The pruritus, which is one of the marked symptoms, may be alleviated by the subcutaneous injection of boiled distilled water under the lesion. Carbon bisulphide as an ointment has given good results.

DISEASES DUE TO FILTERABLE VIRUSES.

BOYÉ. **La rage canine au Moyen Congo.** [Canine Rabies in the Middle Congo.]—*Ann. Méd. et Pharm. Colon.* 1922. May–Aug. No. 2. pp. 228–231.

The first case of canine rabies has been detected in the Middle Congo. The dog in question was a large one of a European breed which had come from the Belgian Congo, and which was found by villagers in the jungle near Maloukou. It bit a number of other dogs, some fowls and some of the villagers. It was captured and taken to Brazzaville. It was impossible to keep it under observation as it was in a condition of extreme excitement.

Inoculations were made with its medulla into guinea-pigs and rabbits and the conclusion arrived at was that the case was probably one of African rabies, which has already been observed in West Africa, and which does not appear to be transmissible to man. None of the villagers bitten showed any suspicious symptoms, and one of these was bitten on the lip. Nevertheless in view of the difficulty of making a definite differentiation between the two types of the disease, regulations regarding dogs were put into force. The native dogs were quickly killed off, but European dogs were left. A second case of rabies occurred in one of these.

Some experiments were carried out with the virus obtained from the first dog.

Five passages of this through the rabbit regularly caused death in from 15 to 20 days.

Rabbits inoculated from the brain of the second dog had not shown any symptoms up to the time of the report, viz., 12 days.

Two rabbits were inoculated with the brain a of rabid rabbit imported from Paris. Immediately afterwards one of these was given protective treatment with the brain of a rabbit killed with the African virus. The untreated one died on the ninth day and the other survived.

Similar comparative tests between the fixed virus and the African virus have been carried out on too few animals, and contain so many unknown factors that no opinion as to their value can be expressed.

REMLINGER (P.). **Contribution a l'étude de l'atténuation du virus rabique fixe pour l'homme.** [The Attenuation of the "Fixed Virus" for Man.]—*Arch. Insts. Pasteur de l'Afrique du Nord.* 1921. Vol. 1. No. 3. pp. 233–235.

In this article the author describes a case in which, in error, a spinal cord which had been desiccated for 44 hours only was used for a subcutaneous injection in mistake for one which had been desiccated for six days. No ill effects resulted. The cord used was approximately at its 1,300th passage.

VICARIOTTO (S.). **Sull' incubazione della rabbia.** [The Period of Incubation in Rabies.]—*Jl. Mod. Zooiat.* 1922. Sept. Vol. 33. No. 9. pp. 217–218.

The author records a case of rabies in a horse in which the period of incubation was 143 days.

SCHEIN (H.). **Note sur la peste bovine.** [Note on Cattle Plague.] —*Rec. Méd. Vét.* 1922. Nov. 15. Vol. 98. No. 21. pp. 621–632.

The author objects that he has been misread by van SACEGHEM and CROVERI, who make references to his work in their own publications. These authors have criticized the quantity of serum used by Schein in immunizing animals by the simultaneous method. Schein replies that the dose criticized—50 cc. per 100 kg. body-weight—refers to the dose for the extremely susceptible eastern buffalo.

Van SACEGHEM's criticism is that the "enormous dose" of serum neutralizes the virus injected at the same time. Schein's criticism of this is that his own and others' experiments have shown that anti-rinderpest serum has no direct action upon the virus in the way of neutralizing or destroying it. He holds that the serum acts by strengthening the defences of the body in some way. For very susceptible animals, therefore—goats, buffaloes and pure bred stock—he injects the serum first with a view to "impregnating" the animal. On the other hand the ordinary cattle of Indo-China may be injected simultaneously with serum at the rate of 27 cc. per 100 kg. and 5 to 6 litres of blood or peritoneal washings. The effect of the serum is held to be not proportional to the amount of virus injected. The poor curative properties of serum are held to support this view.

Van SACEGHEM gives a very small dose of virus and after an interval of four or five days injects a large quantity of serum intravenously. The results obtained in Indo-China contraindicate this method.

Attention is drawn to the danger of intravenous injections of serum.

Schein objects to CROVERI's method in that the latter furnished no evidence by means of controls that his diluted virus was virulent.

Schein gives his reasons for believing that the virus of cattle plague is localized in the leucocytes and not in the red corpuscles, as many authors think. Schein criticizes GORDZIAKLOWSKI's attempts to attenuate the virus by heat, and points out that this method has been tried by others and has failed.

MOUSSU (R.). **Observations clinique et recherches experimentales sur la méningo-encéphalomyélite enzootique du Cheval (Maladie de Borna).** [Clinical Observations and Experimental Investigations regarding Borna Disease.]—*Rec. Méd. Vét.* 1922. Sept. 15. Vol. 98. No. 17. pp. 499–511. With 2 charts.

The outbreak described occurred in a thoroughbred breeding establishment which comprised in all some 80 animals. Fifteen cases occurred in less than two months, and of these six were fatal.

There appeared to be two types of the disease, which are designated by the author meningo-encephalitis and meningo-myelitis. In some instances symptoms of both of these conditions were observed, in fact the " mixed " form of the disease accounted for nine of the cases.

In the meningo-encephalitis cases there were periods of extreme excitement, which became longer and more frequent as the disease progressed. The temperature which was normal at first became slightly raised in the later stages. There was no observable motor paralysis save that deglutition appeared to be difficult, and there was only a dullness of sensation ; pin-pricks always elicited a response.

The meningo-myelitis form was observed in one instance only. In this case motor paralysis was marked in the hind quarters. There was a constant escape of highly albuminous urine, and the temperature was below normal. The case was first under treatment, and after remaining stationary for four days began to improve. Eventually a complete recovery was made. The paralysis disappeared in a week, and the albuminuria after a fortnight. All the animals which showed the meningo-encephalitis symptoms died, but only one of those showing what the author describes as the " mixed " form of the disease. In the former cases death took place within 40 hours, but in the latter the animal lived for six days.

The lesions found post-mortem were those of an acute or rapidly fatal septicaemia, and the author draws special attention to the fact that they very closely resembled those of anthrax. Anthrax was in fact excluded as a result of negative inoculation tests.

The cases were treated by subcutaneous injections of urotropine (15 g. twice daily in 150 cc. of tepid salt solution), and the same drug in 10 g. doses appeared to be of value as a prophylactic.

As a result of certain experiments, which are briefly described, the author concludes that Borna disease is due to a filterable virus and is transmissible to the rabbit. In all cases the inoculations were made into the anterior chamber of the eye.

WOODCOCK (H. M.). **Are the Active Principles of Filter-passing and " Ultramicroscopic " Viruses Living Organisms or Enzymes ?**—*Jl. Royal Army Med. Corps.* 1922. Oct. Vol. 39. No. 4. pp. 243–260. With 10 figs.

As this paper contains expressions of the author's views it does not lend itself readily to abstraction.

Broadly speaking, he takes exception to the view that the small granules, which stain red with Giemsa, which have been detected in infective materials in some of the diseases due to filterable viruses, are the actual causes of those diseases. In a previous paper [*Jl. Royal Army Med. Corps.* 1921. Vol. 37. p. 423] he has given his reasons for believing that such granules result from the breaking down of organized material. A further point upon which he takes a stand is that " it is highly probable that all living organisms contain chromatin,"

and that chromatin is recognizable by means of definite stains, such as iron haematoxylin.

A considerable part of the present paper is devoted to an elaboration of the above views.

The opinion is expressed that the causes of the "virus diseases" are enzymes, and the suggestion is put forward is that the cells acted upon by such enzymes in turn produce more of them.

The "granules" while not representing the viruses do "indicate" them, in that they represent the only objective manifestation which we can at present obtain of their existence.

The difficulty of explaining the development of immunity to virus diseases has to some extent been overcome by the production of antilytic serum by BORDET & CIUCA.

Viruses have as yet been cultivated in tissue-containing media only, and the author explains the multiplication of the virus (the increase in the amount of enzyme) on the grounds that fresh quantities of enzyme are liberated through the destruction of the tissue cells in the media.

DE BLIECK (L.) & WINKEL (A. J.). **De virulentie van de smets tof van het mond— en klanwzer in den Winter 1921-1922.** [The Virulence of the Virus of Foot and Mouth Disease during the Winter 1921–22.]—*Tijdsch. v. Diergeneeskunde.* 1922. Oct. 15. Vol. 49. No. 20. pp. 711–720.

PFEILER (W.) & GOERTTLER (V.). **Zur Züchtung des "Kultur-Virus" der Maul- und Klauenseuche. Seine Identifizierung mit Hilfe von Immunitätsreaktionen.** [The Cultivation of the "Culture-Virus" of Foot and Mouth Disease and its Identification by means of Immunity Reactions.]—Sonderabdruck aus "*Tierärztliche Rundschau.*" 1922. No. 26.

MISCELLANEOUS.

CHURCHMAN (J. W.). **The Mechanism of Bacteriostasis.**—*Proc. Soc. Exp. Biol. & Med.* 1922. Vol. 20. No. 1. pp. 16–18.

It is generally assumed, and almost always correctly so, that if bactericidal substances added to culture media exhibit selective hostility to bacteria they will exhibit a hostility—selective in the same sense—when added directly to the organisms themselves.

This assumption is not always justified. If *B. prodigiosus* and *B. megatherium* be planted on fuchsin agar the former grows well and the latter not at all. If, however, the organisms be first exposed to acid fuchsin and then planted the reverse occurs. A similar result is obtained with the flavines. It is suggested that the bacteriostasis produced when the bacteria are exposed to the substance before planting should be termed intrinsic bacteriostasis, and that occurring when the bacteria are planted on a medium containing the substance as extrinsic bacteriostasis. The author believes that the selective action is dependent upon the H.-ion concentration at the surface of the bacteria.

CHURCHMAN (J. W.). **Bacteriostasis with Mixed Dyes.**—*Proc. Soc. Exp. Biol. & Med.* 1922. Vol. 20. No. 1. p. 19.

Chemotherapy is largely concerned with attempts to strengthen the weakness of bactericidal and parasiticidal substances. It has recently

been found that in some cases this may be achieved by mixing dyes which have previously been shown to have opposite bacteriostatic properties. It has also been shown, for example, that acid fuchsin and gentian violet possess bacteriostatic properties which are in many important respects opposed. These dyes, however, cannot be mixed.

The author has discovered that neutral acriflavine, which resembles acid fuchsin in its bacteriostatic properties, will mix with gentian violet, and that the resulting substance acts like a mixture.

If an emulsion containing *B. anthracis* and *B. pyocyaneus* be exposed to gentian violet and streaked on plain agar, a culture of *B. pyocyaneus* will result. If the gentian violet be replaced with acriflavine a growth of *B. anthracis* will be obtained. If the dyes be mixed no growth is obtained.

SENEVET (G.). **Emploi de l'alun de fer pour le nettoyage des lamelles dévitrifiées.** [The Use of Iron Alum for Cleaning Devitrified Slides.]—*Arch. Insts. Pasteur de l'Afrique du Nord.* 1921. Vol. 1. No. 3. p. 337.

It is well known that, particularly in tropical countries, slides kept for a long time in their original boxes assume a milky appearance as a result of partial devitrification.

Such slides may be cleared by allowing them to remain in a 3 per cent. solution of iron alum for a variable length of time, depending upon the degree of milkiness and then rubbing them while in the solution between the finger and thumb. They are then washed and dried and are ready for use.

ANDREWS (W. H.). **Criticism of Dr. Scharrer's paper on Bovine Staggers.**—*Jl. Comp. Path. & Therap.* 1922. Dec. Vol. 35. No. 4. pp. 280–285. [For abstracts of Andrews' original paper and Scharrer's paper see this *Bulletin*. 1922. Aug. Vol. 10. No. 3. p. 94; and Nov. No. 4. p. 138.]

Andrews draws attention to the complete absence of description of the methods employed and of details in respect to any experimental case of intoxication, rendering it impossible for any personal judgment to be passed on the conclusions drawn.

SCHARRER refers to the occurrence of symptoms of gastro-enteritis, nephritis, irritation of the sexual organs in domestic animals soon after they have eaten the plant. Andrews observed none of these, save that half the cattle used showed evidence of abdominal pain.

Andrews traverses SCHARRER's statement that loss of condition is noted before symptoms appear. This was never observed in natural cases, but only in experimental animals having an unnaturally large amount of the plant. Even in these it was considered to be possibly due to partial starvation in conjunction with the large amount of matricaria.

SCHARRER states that a larger dose is tolerated if spread over a long period. Andrews' results indicated that within limits prolonging the period of administration tended to cause a smaller amount to become effective.

SCHARRER states that bovine staggers occurs mainly at the end of the autumn and refers to the connection between glucoside formation and the maturing plants. Andrews' extensive inquiries indicated that the spring is the main staggers season, and he draws attention to the fact that most of the plants have matured long before the autumn.

With regard to SCHARRER's statement that the period of incubation may be as long as 12 to 15 weeks, Andrews comments that there is reason to believe that during this period some of SCHARRER's cattle were in paddocks where the plant was actually growing, but he does not deny that under certain conditions it may be even longer. The absence of experimental evidence in support of SCHARRER's statement that the intoxication could be prevented or delayed by giving food rich in albumen is severely commented upon. Andrews' experiments completely negatived this. The criticisms of the chemical portion of the paper are detailed and cannot be summarized succinctly, but Andrews draws attention to many inaccuracies and inexplicit statements which are not supported by experimental evidence.

STOCKMAN (S.). **Bracken Poisoning in Cattle in Great Britain.**— *Jl. Comp. Path. & Therap.* 1922. Dec. Vol. 35. No. 4. pp. 273–275.

The author publishes details of two experiments on bracken poisoning with a view to clearing up doubts which have been expressed regarding the occurrence of this condition. Several factors have led to doubt being cast upon the possibility of poisoning occurring through the ingestion of bracken. These are : (1) bracken appears to be poisonous during certain parts of the year only (August to November) ; (2) a considerable quantity spread over 3–4 weeks must be ingested in order to produce symptoms ; (3) the occurrence of high temperature (107°) in the acute stage.

A second reason for carrying out the experiments was to obtain evidence on the question of whether the condition might not in reality be one of the forms of scurvy.

In the first experiment a calf was fed with a ration of 4 lb. (increased three days later to 6 lb.) of newly cropped bracken together with bran and oats. Twenty-seven days later the animal looked ill and refused food, and the temperature rose to 107° and definite symptoms appeared. In view of the suggestion that the condition might be one of avitaminosis feeds of swedes were offered. They were refused but eaten the next day. The temperature was now 105° and the animal was unable to rise the following day and died.

In the second experiment the swedes, which are rich in vitamins, were given with the bracken with a view to ascertaining whether they would influence the progress of the condition in any way.

By the end of the fourth week the calf had eaten 112 lb. of bracken and symptoms made their appearance. The temperature rose to 107° and the animal died showing typical symptoms two days later.

Results of further experiments on other species and with extracts are promised.

MOTAS (C.), PURICESCO (O.), SACHELAIRE (V.). **Quelques essais de traitement de la maladie des chiens par le Néosalvarsan.** [The Treatment of Distemper with Neosalvarsan.]— *Archiva Veterinaria.* 1922. Vol. 16. No. 4. pp. 165–168.

The authors give details of six cases of distemper treated with neosalvarsan, and they conclude that :—

1. Doses of 0·05 to 0·1 g. may be given with safety by intravenous injection (1 g. in 20 cc. of distilled water).

2. In the septicaemic form of the disease the temperature drops within six hours.

3. Marked improvement takes place in 4 to 5 days and recovery follows.

4. It remains to be ascertained whether an animal that has been cured can be reinfected.

ROBERT (L.). **Un cas d'Anaphylaxie locale à l'émétine. Oedème envahissant, pruril intense, puis érythème vésiculeux consecutifs à des injections d'émétine.** [A Case of Localized Anaphylaxis due to Emetine.]—*Bull. Soc. Path. Exot.* 1922. Oct. Vol. 15. No. 8. pp. 680–683.

The case in which the symptoms referred to in the title were observed was one of dysentery. The disease first manifested itself in 1910. In 1916 the patient appeared to make a complete recovery as a result of four injections of emetine. Four years later the disease again appeared and again an apparent cure was effected by four injections of emetine. On neither occasion were untoward symptoms observed after the injections. A relapse occurred two months after the second set of injections and treatment was begun again with emetine. The first injection produced no local effects, but the second was followed by the development of a slight temporary oedema at the seat of injection accompanied by a moderate amount of pruritus. The patient appeared to recover.

Several months later a relapse occurred and the patient who lived at a considerable distance from Bangkok treated himself with injections, having taken the precaution of providing himself with ampoules of the drug. He gave himself eight injections in all and after each there was progressively more extensive oedema and more severe pruritus. These were put down to some defect in the drug, but as recovery took place the matter rested at that.

In 1922 dysentery again made its appearance. Examination revealed the presence of active and encysted amoebae and *Lamblia intestinalis*.

On applying emetine treatment the severe oedema and pruritus were again developed. Four injections were given with the same results. A cuti-reaction with emetine again produced oedema and pruritus.

The patient shortly afterwards consulted another doctor, and in spite of previous experience had an injection of emetine. The oedema produced was on this occasion complicated for the first time by the development of vesicles.

LEGER (A.). **Corps de Graham-Smith dans les hématies d'un Primate** (*Macacus rhesus*). [Graham-Smith Bodies in the Red Corpuscles of a *Macacus rhesus*.]—*Bull. Soc. Path. Exot.* 1922. Oct. Vol. 15. No. 8. pp. 679–670.

The author agrees that Graham-Smith bodies are parasites. He found them in the blood corpuscles of a *Macacus rhesus* in the Hué Laboratory (Annam). Corpuscles containing them were present in the proportion of one in eight to ten fields of the microscope. They were bacillary or coccus-like in shape and were not evenly distributed throughout the containing corpuscles, but appeared to be more or less

massed together. They could not be detected in moist films. The blood showed no corpuscular abnormalities save the occasional presence of a nucleated red cell.

The animal showed no evidence of ill-health and the bodies showed no changes during the time that the animal was under observation (two months).

The name *Grahamella rhesi* is suggested.

BAUER (H.). **Die Lahmkrankheit des Rindes in Südafrika und Kochsalzvergiftung.** [Lamziekte in South Africa and Salt Poisoning. —*Arch. f. wissensch. u. prakt. Tierheilk.* 1922. Sept. 19. Vol. 48. Nos. 3 & 4. pp. 153–201.

This paper is an abridged copy of an earlier "dissertation" by the author. The greater part of it is made up of an account of other investigators' views regarding lamziekte. The author is of the opinion that the disease is in reality due to salt poisoning.

VELU (H.). **Rapport sur le fonctionnement du "Laboratoire de Recherches au Service de l'Elevage du Maroc" pendant l'année 1920.**—*Arch. Insts. Pasteur de l'Afrique du Nord.* 1921. Sept. Vol. 1. No. 3. pp. 338–344.

VELU (H.). **Rapport sur le fonctionnement du "Laboratoire de Recherches du service de l'Elevage du Maroc" pendant l'année 1921.**—*Arch. Insts. Pasteur de l'Afrique du Nord.* 1922. Sept. Vol. 2. No. 3. pp. 444–450.

REVIEW.

SEURAT (L. G.) [Professeur-adjoint à la Faculté des Sciences, Université d'Alger]. **Histoire naturelle des Nématodes de la Berbérie. Première Partie. Morphologie, Développement, Ethologie et Affinités des Nématodes.**—1920. Algiers. Université d'Alger. Publication de la Faculté des Sciences. pp. 1–221. With 34 text figs.

This is the first part of a monograph on Nematodes. Although its scope is restricted to those forms occurring in Northern Africa, the fauna of that region is in this respect sufficiently rich to furnish representatives of every group. The work is therefore rather more comprehensive than its title would at first sight suggest. It is divided into ten chapters, of which the first five are mainly devoted to a systematic survey of morphological characters, Chapters 6 and 7 to development and life history, Chapter 8 to habitat and geographical distribution, Chapter 9 to variation, vital resistance and the parasites of nematodes, and Chapter 10 to a consideration of the relationships and affinities of nematodes with other groups. Under each of these headings the free-living nematodes, as the older and simpler type, are first considered. Subsequently the parasitic forms receive separate treatment, the amount of space devoted varying with the degree of modification or specialization which has taken place in the process of adaptation to a parasitic existence.

The morphological section occupies 91 pages. The author endeavours to indicate the primitive form of each structure, to discuss briefly its embryology and finally to indicate subsequent modifications and specializations, most of which are furnished by the parasitic forms. From the medical or veterinary point of view the most interesting portion of the work begins with the consideration of copulation and the development

of the embryo in the egg. It is noted that the males search for females of the same species. It is a fact, however, that in the case of certain species of *Strongylus* and *Cylicostomum*, parasitic in equines, one not uncommonly finds mixed copulation taking place, even where both sexes of each of the two species concerned are present in the contents of the gut. Attempts by MAUPAS to induce cross-breeding between two geographical varieties of the same species (*Leptodera maupasi*) were unsuccessful, and efforts by the same worker to hybridize two closely related species of *Diplogaster* resulted in the production of sterile hybrids. These observations suggest that in the case of the mixed copulations of cylicostomes production of sterile hybrids is possible. It is observed that among certain oxyurids copulation takes place between an adult male and an immature female. A similar arrangement is seen among mites, where the male usually fertilizes the female nymph.

Passing to the extremely interesting sections dealing with development and life-history, the author deals first with the simplest type of free-living nematode, using *Cephalobus ciliatus* as the example. From the egg of this species is hatched a first stage larva, which moults after about four days. The second stage undergoes a further moult under favourable conditions eight days after the first. Under conditions of comparative drought the second stage larva encysts in its old cuticle after the second ecdysis, but under normal conditions the development proceeds uninterrupted, the second ecdysis is completed and the third moult takes place some nine days later. After ten or eleven days the larva undertakes the fourth and last moult, and becomes adult. The most interesting feature of this simple life-history is the ability of the larva to remain ensheathed or encysted after the second ecdysis if conditions are unfavourable. It is upon the survival of this encysted stage that the continuity of species depends throughout both free-living and parasitic groups, from the very simple to the most complex and highly organized forms.

Heterogonic Nematodes.—Passing to the more highly developed forms, Seurat considers under this heading forms in the life-cycle of which both free-living and parasitic conditions obtain. The ensheathed larvae of *Rhabditis pellio* are able to enter the body cavity of various invertebrates and there remain quiescent until circumstances favour the continuance of their evolution. The life-history of *Strongyloides stercoralis* represents a considerable advance in adaptation to the habit of parasitism. The members of this genus are common parasites of man and domesticated animals in tropical and sub-tropical regions. The parasitic stage consists of parthenogenetic females producing eggs which hatch in the intestine, liberating rhabditiform larvae which pass out in the faeces. The precise form which the evolution of these larvae takes depends on the temperature. If the temperature is from 25° to 35° C., as is usual in the tropics, the development proceeds along the usual lines to the free-living adult forms with separate sexes. The free-living female deposits some 30 or 40 eggs which hatch rapidly, liberating rhabditiform larvae. These first stage larvae after a moult become filariform or strongyloid larvae, and as such are capable of infecting a host by the mouth or skin and developing into the parthenogenetic parasitic stage. If the temperature to which larvae leaving the intestine of the host are exposed is below 20° C. the life-cycle is short-circuited, completely cutting out the free-living phase. Under these conditions the larvae moult, becoming filariform and ready for immediate re-entry into the host. According to Seurat it is probable that the infective larvae in both of these cases are ensheathed.

Purely Parasitic Forms.—Seurat divides these into two groups—Monoxenous and Heteroxenous.

Monoxenous Parasites.—These are parasites with a direct life-cycle, making use during life of one host only. It is convenient to divide these into two groups—those the eggs of which are usually small, thin-shelled and poor in food material, and those with larger eggs, enclosed by a stout shell, and usually containing a considerable reserve of food material.

In the first category are included such forms as *Haemonchus, Strongylus, Ancylostoma, Uncinaria,* etc., and in this group eggs give rise to a small rhabditiform larva which feeds and grows rapidly. After the first moult the larva loses its rhabditiform characters, but continues to feed. Finally it moults, remaining within the old cuticle of the second stage as an ensheathed larva. The ensheathed larva possesses a varying but always considerable degree of resistance to desiccation and cold, and of course requires no food. This stage is infective for the host animal in certain cases (*Ancylostoma, Stephanurus*) by skin or mouth, in other cases by mouth alone (*Haemonchus,* etc.). The remaining moults take place in the body of the host. It is perhaps relevant to mention here that in the case of some of these forms (*Ancylostoma*) the larvae pass through the lung *en route* for their final location in the intestine. Other forms (*Cylicostomum, Oesophagostomum*) enter the wall of the intestine and there undergo larval development.

In the second category it is found that the reserve of food material in the large egg is sufficient to nourish the larvae during the first and second stages, thus rendering it entirely independent of its environment in this respect. In this second group one finds such forms as *Dictyocaulus, Ostertagia, Nematodirus, Ascaris, Oxyuris,* etc. In the case of the common bronchial parasites of sheep and cattle, *Dictyocaulus filaria* and *D. viviparus,* the egg hatches, liberating a first stage larva without mouth opening or rhabditiform oesophagus. Although the larva does not feed, it undergoes a moult and reaches the ensheathed stage or period of the second moult under free-living conditions. It is then in the infective stage, and possesses considerable powers of resistance owing to its possession of a sheath. In the case of *Ostertagia* the first ecdysis takes place within the egg, the larva at the time of hatching being in the second stage. Ensheathment follows soon after hatching. The first ecdysis and part of the second up to separation of the old cuticle takes place in the eggs of *Nematodirus,* the larvae being ensheathed when hatched. In certain species of *Nematodirus* this encystment actually takes place in the uterus of the female prior to deposition. *Ascaris lumbricoides* progresses still further in the adaptation of the egg to the protection of the larva from external conditions. The larvae in the case of *Ascaris* do not leave the eggs until the latter have been taken into the body of the host. The extreme powers of resistance of the eggs of *Ascaris* are too well known to need more than a passing reference. Ecdysis within the egg has not been observed in the case of *Ascaris lumbricoides,* but Neuville and Seurat observed encystment within the egg in the case of *Toxascaris leonina.* The egg of *Oxyuris* (*Enterobius*) *vermicularis* contains a first stage larva at the time of deposition. It is probable that when the eggs are evacuated in the faeces or rectal mucus the larvae within the egg have reached the second or infective stage.

Heteroxenous Nematodes.—In this group the free-living phase is more or less suppressed and a period of existence in an intermediate host is substituted. The first stage larvae of *Camallanus lacustris* are set free in water, where they may live some weeks. It is only after entering the body of a small crustacean (usually *Cyclops* sp.) that a moult takes place and the second stage larva proceeds to become ensheathed. It is in this stage that the transfer to the intestine of the final host (perch, etc.) takes place. The development of the Guinea-worm is in all essentials similar. In the case of Spirurids and Acuariids the egg generally does not hatch until taken in by the intermediate host, usually a coprophagous beetle. In the body of the intermediate host the larva reaches the ensheathed stage, and so remains until taken in by the definitive host. This group includes *Spirocerca, Physocephalus, Gongylonema,* etc. A further modification is shown by such forms as *Dirofilaria immitis.* The embryos still enclosed within the vitelline membrane are free in the general circulation of the host. They pass into the stomach of the mosquito still in this embryonic envelope and migrate to the Malpighian tubules; later the larvae burst out of the tubules and eventually gain the labium of the

insect, to be reinoculated into the definitive host. It does not appear to have been ascertained how many actual moults (if any) take place in the body of the mosquito, but analogy would suggest that the larvae are possibly in the ensheathed stage at the time of their transference to the final host. In this group fall *Loa*, *Acanthocheilonema*, etc. *Trichina* furnishes the last group of veterinary interest. Here the larvae are encapsuled in the skeletal muscles of the actual host that harbours the adult forms. The ensheathed larvae may subsequently gain access to the intestine of another host of the same species or one of the alternative hosts of the parasite. *Trichinella spiralis* is thus unique in that the one animal harbours the adult and at the same time serves as intermediary host for the developing forms.

It is probably unnecessary to state that the author is unable to deal in detail with the life-history of every parasitic nematode where this is known. What has actually been done is to analyse the life-history of these forms and to arrange them in arbitrary groups according to their manner of development. Such grouping must perforce be somewhat elastic. The arrangement reached in this manner does not differ strikingly from the usually accepted scheme of systematic classification. This fact speaks for the accuracy and soundness, of the author's observations on the one hand, and of the general systematic classification on the other. The monograph will prove extremely valuable to all workers in helminthology.

R. Daubney.